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of Engineers

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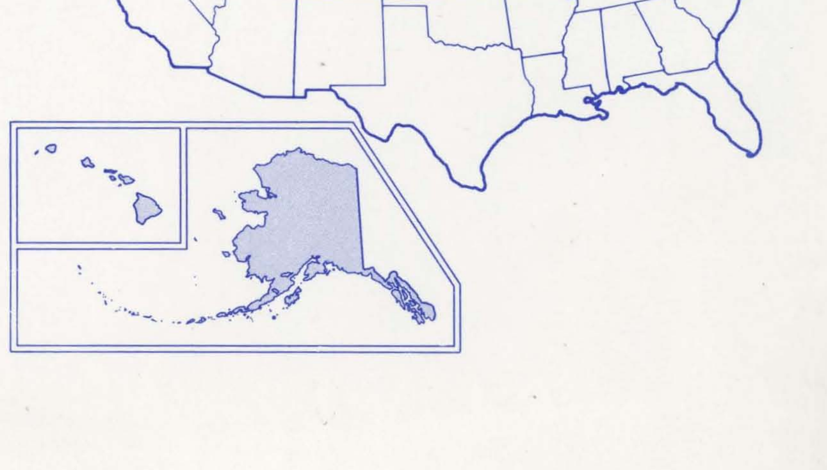
Volume XXIII
September 1981

Regional Assessment: Alaska and Hawaii



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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This volume briefly describes existing conditions (physical, social, economic) affecting electric supply and demand in the states of Alaska and Hawaii. It discusses the existing electric energy system and the role of hydropower therein. Projections of electrical supply and demand through the year 2000 are discussed. The hydropower resources, developed and undeveloped, of the region are evaluated and a regional ranking of specific projects and sites which are recommended to be studied in further detail is presented. The public involvement in the planning process is described.

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National Hydroelectric Power Study
Regional Report: Volume XXIII

Alaska

September 1981

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PREFACE

The economic success and standard of living in this country have been achieved, in part, at the expense of abundant supplies of low cost, non-renewable, energy sources. In recent years however, diminishing reserves of the preferred non-renewable energy sources, i.e. oil and natural gas, have prompted a national energy policy which emphasizes conservation and the development of new and renewable sources of energy. This report is a direct result of the national energy policy as it focuses on our major existing renewable energy resource, hydroelectric power.

Congress, in the Water Resources Development Act of 1976 (P. L. 94-587), authorized and directed the Secretary of the Army, acting through the Chief of Engineers, to undertake a National Hydroelectric Power Resources Study (NHS). The primary objectives of the NHS were (1) to determine the amount and the feasibility of increasing hydroelectric capacity by development of new sites, by the addition of generation facilities to existing water resources projects, and by increasing the efficiency and reliability of existing hydroelectric power systems; and (2) to recommend to Congress a national hydroelectric power development program.

The final NHS report consists of 23 volumes. Volumes I and II are the Executive Summary and National Reports respectively. Volumes III and IV evaluate the existing and projected electric supply and demand in the United States. Volumes V through XI discuss various generic policy and technical issues associated with hydroelectric power development and operation. Volumes XII and XIII describe the procedures used to develop the data base and include a complete listing of all sites. Volumes XIV through XXII are regional reports defined by Electric Reliability Council (ERC) regions. The index map at the inside back cover defines the ERC regions. Alaska and Hawaii are presented in Volume XXIII.

This volume, number XXIII, describes the hydroelectric power potential in the states of Alaska and Hawaii. A map depicting all sites described in the text is located in the jacket, inside back cover.

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Chapter 1
REGIONAL OBJECTIVES

Within the last generation, hydropower investigations in Alaska have identified many potential projects throughout the State. Except in Southeast Alaska, however, very little was known about the extent of the State's hydropower resources prior to World War II. After the war, serious interest appeared, motivated by a worldwide search for large low-cost hydropower projects that could be used for the production of aluminum and a desire to provide a viable economy in the then Territory of Alaska. More recently, the oil embargo of 1973 and subsequent price increases served to revive interest in hydropower development. License applications for study and construction of hydropower facilities continue to be received by the Federal Energy Regulatory Commission (FERC) in record numbers. With the vast undeveloped hydropower potential in Alaska, combined with the ever-increasing cost of thermal energy resources, particularly the cost of oil and gas, the outlook for construction of hydropower plants in Alaska is promising. In addition, through the establishment of the Alaska Power Authority, the State has developed the institutional, technical, and financial capability to provide the catalyst necessary for hydropower development to proceed.

Considering all of the possiblities, the findings of this study indicate an undeveloped hydropower potential of 42,700 megawatts of capacity and 224.4 billion kilowatt-hours of energy (25,600 average megawatts). Most of Alaska's potential hydropower, however, is not needed within the state and is not economically feasible to transmit to the potential users outside the State. Within the State, the electrical economy has become heavily dependent upon fossil fuel energy. Diminishing reserves of these traditional primary energy sources have prompted a national energy policy which emphazises both energy conservation and development of new sources of primary energy. The potential for developing some new hdyropower projects as well as an opportunity for retrofitting existing hydropower projects exists. While some limitations on development are obvious and were evaluated through rather cursory examination, other constraints were extremely complex and required detailed engineering analyses. These issues were investigated, in assessing the realistic potential contribution that hydropower could make in meeting Alaska's growing electric energy demands.

1.1 REGIONAL OBJECTIVES

The overall objectives of the NHS were to identify and assess the potential for development of the nation's hydropower resources to help meet the short and long term energy demands of the nation. The evaluations conducted during the study considered the physical potential, economic costs, environmental and social impacts, institutional constraints, and marketability.

The following specific objectives were established for Alaska:

1. To decrease the State's dependency on oil and gas for generating electricity.

2. To analyze and define the State's need for hydropower.

3. To assess the potential for increasing hydropower capacity and energy at existing dams and undeveloped sites.

4. To analyze the current marketing constraints to additional hydropower development.

5. To assess the general environmental and socio-economic impacts of the development of specific hydropower projects.

6. To recommend maximum feasible utilization of the energy potential derived from the State's hydropower potential consistent with regional demand for electricity and the State's environmental quality objectives.

1.2 OTHER STUDIES

Since World War II a number of studies of Alaska's potential hydropower resources have been completed. Major early studies included government and private studies on both the Wood Canyon and Yukon - Taiya projects and a comprehensive inventory of the hydroelectric resources of Southeast Alaska published by the U.S. Forest Service and the Federal Power Commission in 1947. The purpose of that report was to bring together the best available data assembled on hydropower and provide a basic listing of potential energy generating sources for the industrial growth of the Southeast region.

The Bureau of Reclamation first conducted a statewide field reconnaissance study of Alaskan hydropower projects in 1948. Attention was focused on the Susitna River basin potential and other hydropower projects. That reconnaissance initiated the study which led to the authorization and development of the Eklutna Project near Anchorage. Other investigations were completed in 1953 on several smaller projects in other parts of the State.

A separate series of regional water resource studies by the Corps of Engineers investigated alternative hydropower development strategies including the investigation of the Rampart project on the Yukon River. Reconnaissance studies on the Rampart project indicated an immense potential of low-cost hydropower. Further investigations by the Department of Interior and feasibility reports by the Corps of Engineers recommended that the Rampart project not be developed due to environmental effects, the lack of a power market, and an abundant supply of inexpensive natural gas. Interim solutions were needed and alternative options included a number of smaller projects. One of those options, Bradely Lake near Homer, although authorized for construction by the 1962 Flood Control Act, remains unconstructed.

As part of the Department of Interior investigation, the Bureau of Reclamation prepared a comprehensive inventory of the statewide hydropower resources between 1962 and 1967. This extensive work essentially provided a complete identification of potential sites in Alaska. That inventory benefited from a great deal of information that was previously not available in a comprehensive inventory. The Alaska Power Administration has updated major portions of that inventory, screening the summary to 252 of the most favorable potential hydropower sites in Alaska. The initial inventory included data on physical potential, mapping, hydrology, cost estimates, and in a few cases field checks for engineering suitability. The results were published in the 1969 and 1976 Alaska Power Survey by the Federal Power Commission.

In addition to the NHS, in 1978 the Corps of Engineers initiated studies to determine the potential for small (less than 5 MW) hydropower projects throughout Alaska. Reports for the Southeast and Aleutian Islands areas have been completed while the report for the Southwest subregion is scheduled for completion in the near future. These reports address or will address potential sites that would produce less than 1 megawatt of power.

Chapter 2
EXISTING CONDITIONS

2.1 ALASKA GEOGRAPHIC/HYDROLOGIC SUBREGIONS

Alaska is divided into six geographical/hydrological subregions which are based on the major drainage basins within the State. These subregions, as determined by the Interagency Technical Committee for Alaska, are shown on Figure 2-1. These include the Southeast, Southcentral, Yukon, Southwest, Northwest, and Arctic subregions.

Southeast

Southeast Alaska stretches nearly 600 miles along the border of British Columbia. The terrain is typified by high mountains and small drainage basins which lead directly to the ocean. Heavy precipitation with high runoff rates contributes to the opportunity for numerous hydropower developments throughout the entire area. Thirteen percent of the State's population is located within the area. The State capitol, Juneau, is situated midway within the subregion. The principal industries are government, forest products, fishing, and tourism. Because of the steep terrain, glaciers, and many islands, there are no interconnecting highways or power transmsission systems. Transportation is dependent upon air travel and the Alaska State Ferry system. Historically, electrical generation for the larger communities has been furnished by local hydropower supplemented by diesel generation or all diesel. Most of the smaller towns are fully dependent upon diesel generation.

Southcentral

The Southcentral subregion of Alaska is characterized by much lighter runoff, colder climatic conditions, and less steep topography than Southeast Alaska. These conditions result in hydropower sites located mainly on the large river systems such as on the Copper and Susitna Rivers. This area of the State contains approximately 57 percent of the population. Major industries are associated with oil development and processing around Cook Inlet, fishing, seafood processing, government, and trades. Most of the towns in the area are interconnected with good highway and air transporation systems. The major portion of the electrical generation in the Anchorage-Cook Inlet area is provided from natural gas. The area is serviced by a power transmission system between Homer at the south end of the Kenai Peninsula to Talkeetna, north of Anchorage. Electrical service in the Anchorage-Cook Inlet area is provided by five separate utilities. Electrical service to other isolated communities is provided by individual utilities, primarily from diesel generation.

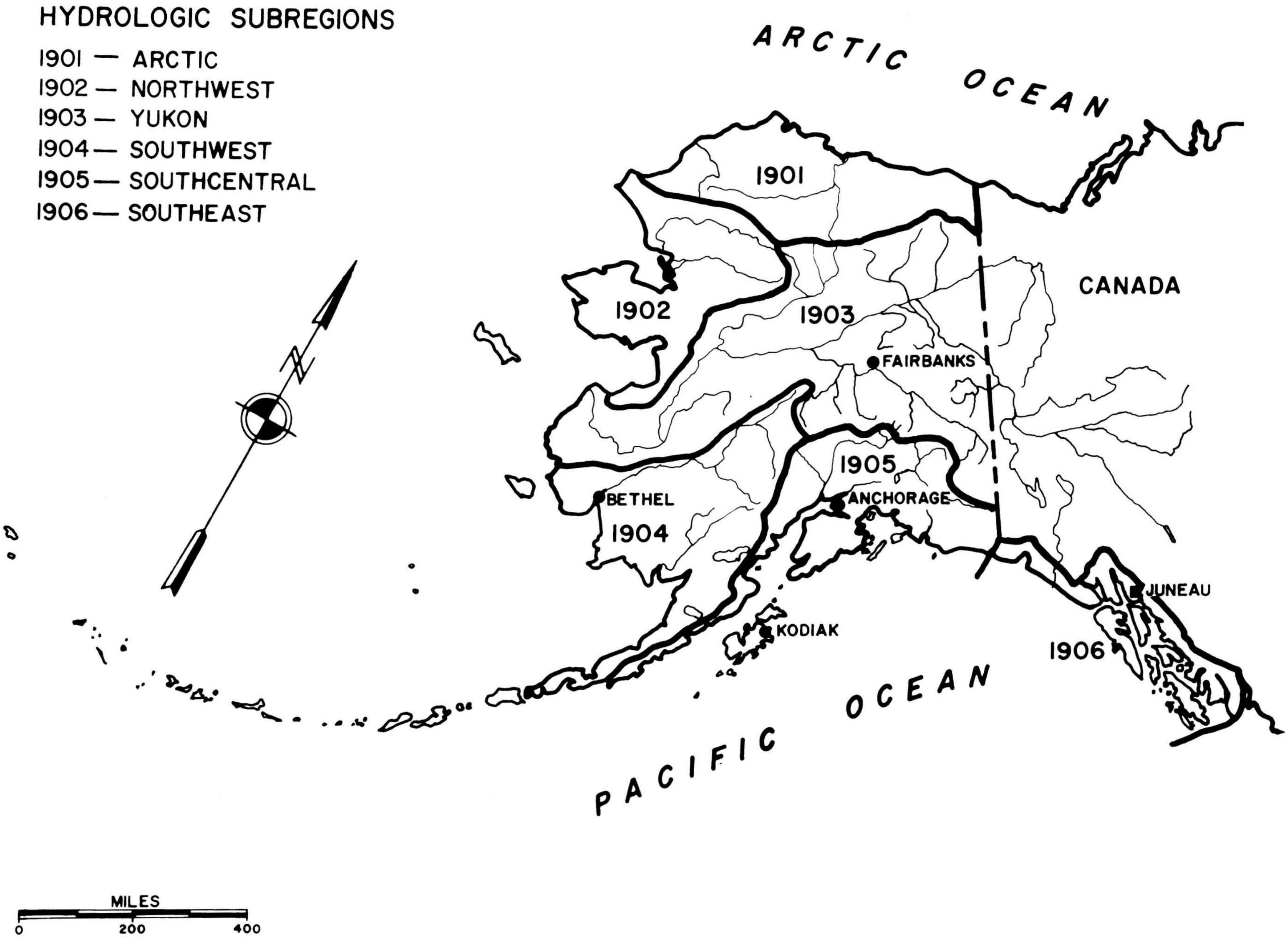


Figure 2-1
RIVER BASINS OF ALASKA

Yukon

The Yukon subregion is the largest of the six subregions with an area of about 204,000 square miles--approximately 35 percent of the area of the State. The Yukon River system and its tributaries have the only hydropower potential in the area. Due to the lack of storage sites, essentially no viable sites exist north of the Alaska Range, including the north slope of the Alaska Range. The area has only a few other sites which could be physically developed in the entire Yukon basin. Most of the better sites on the mainstream river systems have been excluded from possible development by recently enacted Alaska Lands legislation. Roughly 20 percent of the State's population lives in this area with Fairbanks being the main population center. The area's primary economic components are the State and Federal governments, the military, the petroleum industry, and the University of Alaska. Fairbanks experienced rapid growth during the construction of the Alaska pipeline and severe economic decline after pipeline completion. Fairbanks is connected to the Anchorage area by a highway system and to the south 48 states through Canada by the Alaska Highway. It is also served by several airlines and the Alaska Railroad which connects Fairbanks to seaports on Cook Inlet and the Gulf of Alaska. Currently, Fairbanks is supplied by two electric utilities from coal-fired generation and oil-fired combustion turbine generation. Outlying villages in this area are primarily dependent upon diesel engine generation for their electrical needs.

Southwest

The Southwest subregion is about 109,000 square miles in area. The area consists of major river drainage areas of the Kuskokwim, Nushagak, and Kvichiak Rivers, the western flank of the Alaska Peninsula, and the Aleutian Islands. Few good hydropower sites exist within reasonable transmission distances of the major population centers of Bethel, Dillingham, and Naknek. Roughly 5 percent of the State's population lives in this area. The majority of the economy is based on commercial fishing and processing, with government and recreation being other important industries. The streams support one of the world's most productive red salmon fisheries. Recent exploration indicates potential for significant oil deposits in the Bristol Bay area, however, immediate development is being delayed for environmental reasons. Currently, main population centers plus the numerous scattered villages are dependent upon diesel generation for meeting electrical energy needs.

Northwest

The Northwest area is similar to the Yukon area with hydropower sites being limited to the major stream systems. This area constitutes roughly 3 percent of the population of the State. The major towns are Nome and Kotzebue. Primary industries in the area include commercial fishing, fur trapping, and government, with subsistence being the primary method of livelihood in the outlying areas. Transportation to and within the area is restricted to air travel on a year-round basis, while during the summers water travel is available. Electrical power generation is furnished entirely by isolated diesel generation systems.

Arctic

Hydropower potential in the Arctic subregion is severely restricted due to the lack of head, water supply, climate, and economical dam and reservoir sites. The area north of the Brooks Range constitutes roughly 2 percent of the State's population. The area's largest single industry is the oil development at Prudhoe Bay. Other major industries include oil and gas exploration, construction, and government services. Subsistence living constitutes the remainder of the economic activity for this area. Transportation is restricted to air travel on a year-round basis and an occasional barge or ship during the late summer. Electrical generation for the Barrow and Prudhoe Bay oil development areas consists primarily of oil and gas-fired turbines and diesel generators. The outlying villages depend entirely on diesel generation.

2.2 TOPOGRAPHY

Alaska has a land area of 586,412 square miles, approximately one-fifth the size of the United States. Surrounded on three sides by waters of the Arctic and Pacific Oceans and the Bering Sea, Alaska has 46,000 miles of coastline. The topography of the State is extremely diversified, highlighted by two vast mountain systems: the Brooks Range to the north and the Pacific Mountain System to the south.

The Brooks Range, lying about 100 to 200 miles inland from the Arctic Coast, is the northern extension of the Rocky Mountain System. From the Canadian border the Brooks Range extends westward for 600 miles to the Arctic Ocean. Many peaks in the eastern part of this range exceed 9,000 feet in elevation; in the west, peak elevations decrease to an average of 3,000 feet.

The Pacific Mountain System is the continuation of the Coastal Mountain System of the conterminous United States and Canada. This system consists of two parallel arcs that generally follow the coastline from Southeast Alaska to and including the Aleutian Islands. The northern arc includes the boundary of the Alaska and Aleutian Ranges, and the Aleutian Islands. The southern arc includes many of the islands of Southeast Alaska as well as the Fairweather Range, the St. Elias Mountains, the Kenai-Chugach Mountains, and Kodiak Island. Elevations in the Pacific Mountain System range from 1,000 to 4,000 feet, in the Aleutian Range to more than 10,000 feet, and in the Alaska and St. Elias Mountain Ranges to over 20,000 feet (Mount McKinley).

North of the Brooks Range lies the Arctic Coastal Plain which rises gradually from the Arctic Ocean to a maximum elevation of 600 feet at its southern margin. This vast tundra plain is virtually without relief except for scattered groups of low hills east of the Colville River that range in height from 20 to 230 feet.

The intermountain plateau lies between the Brooks Range and the Alaska Range consisting of dissected uplands and broad, alluvium-filled basins. The basin floor ranges in altitude from over 6,500 feet in the Yukon-Tanana uplands in the east to generally less than 1,000 feet in the Yukon-Kuskokwim and Bristol Bay lowlands to the west.

The majority of the people in Alaska live in proximity to the sea coast in the Southcentral and Southeast subregions of the State where they enjoy a moderate climate due to maritime influences. These same areas include extensive glaciers and ice fields at elevations of 2,000 to 3,000 feet above sea level, exhibiting all the characteristics of a very cold alpine climate ecosystem. The continuous permafrost that exists over roughly the northern third of the State and the discontinuous permafrost that extends over parts of the Southwest and Southcentral Subregions present difficult water supply problems.

2.3 HYDROLOGIC CONDITIONS

The highly diverse geographical features of Alaska have a significant impact on the climate of the State. A zone of maritime influence, which extends throughout Southeastern and Southcentral Alaska along the gulf coast experiences a mild, wet climate; annual precipitation reaches as high as 200 inches with higher amounts in the glaciated mountain areas of the region. Away from this maritime coastal zone the climate changes rapidly with decreasing amounts of precipitation and greater extremes in temperature. Average annual precipitation in the interior is 12 inches, decreasing to 6 inches or less along the Arctic Slope. However, considerably more precipitation falls in the interior mountainous area. About two-thirds of Alaska receives less than 20 inches of precipitation annually.

Mean annual temperatures range from 43 degrees F along the maritime coastal zone to 10 degrees F along the Arctic Slope. The interior of Alaska experiences the greatest extremes in temperature. In this region mean-maximum summer temperatures range between 75 and 80 degrees F, while the mean-minimum winter temperatures are in the range -20 to -30 degrees F with extremes down to -50 degrees F and colder.

Climatological differences in Alaska resulting from its unique geography cause a wide variation in the hydrology of streams. Low-lying areas adjacent to the Gulf of Alaska have high unit runoffs and relatively little seasonal variation. In the mountainous areas adjacent to the Gulf, runoff is high, and in the northern part of the State runoff rates are relatively low.

All major streams in Alaska originate within the State except for the Yukon and Porcupine Rivers (Upper Yukon subregion) and the Alsek, Taku, and Stikine (Southeast subregion) whose headwaters are in Canada. All of the streams in Alaska flow into either the Arctic Ocean, Bering Sea, or the Pacific Ocean. The streams in the region fall into two general groups, glacial and nongalacial. Most glacial streams are found in the Southcentral and Southeast subregions, and the southcentral portion of the Yukon subregion.

The Yukon River is the largest in the State and ranks fifth in discharge among streams in the United States. The Yukon drainage that is solely in Alaska covers about 35 percent of the State. The estimated mean annual discharge is 257,000 cubic feet per second (cfs), 32 percent of which flows into the State from Canada. Major tributaries of the Yukon River include the Koyukuk, Tanana, and Porcupine Rivers.

Other principal river systems in Alaska include the Colville (Arctic); Kobuk, (Northwest); Kuskokwim (Southwest), and Susitna and Copper Rivers, (Southcentral). Extensive natural inland lakes in Alaska encompass 5.1 million acres of the State.

The combination of geologic, climatic, seasonal, geographic, and other effects often produces problems and conditions in Alaska for which there are no comparable situations in other parts of the United States. Nevertheless, Alaska has by far the greatest potential of any state for the development of hydropower, particularily in the Southcentral and Southeast regions where topographic conditions are favorable and streamflows are relatively high and uniform. Additional potential exists in the water that is stored in the vast snowfields and glaciers in these regions.

In other areas of Alaska not only the intensity but the duration of cold weather produces unusual effects. The prolonged periods of cold weather and associated permafrost preserve a significant amount of water in a non-accessible, solid state. Shallow rivers and lakes freeze to the bottom or develop several feet of ice cover and remain frozen for most of the year. Low instream flow is the rule for most areas of the State during the winter. Alaska's climate and varied terrain place significant limitations on the supply of water which is available for development of hydropower.

2.4 ECONOMICS OF AREA

Table 2-1 summarizes the significant 1970 demographic and economic data for Alaska. [Economic Area 172, as defined by the Bureau of Economic Analysis (BEA), U.S. Department of Commerce].

In 1970 Alaska's population was 305,000, and represented about 0.2 percent of the national total. Over the period 1962 to 1970, the population grew at an average annual rate of 2.7 percent. The 1975 population was estimated at 405,000, reflecting a high average annual growth of 5.8 percent during the period 1970 to 1975. Preliminary 1980 census figures indicates a current population exceeding 400,000.

Total earnings in Alaska have been growing at an average annual rate of about 4.8 percent. The 1970 Alaska earnings represented about 0.2 percent of the national total. By far, the largest earnings sector has been government, contributing about 44 percent to Alaska's total earnings. Construction and trade also contributed a significant portion to the Alaska total earnings.

The 1970 Alaska per capita income of $4,202 was about 21 percent higher than the national average. Between 1962 and 1970, the Alaska per capita income grew at an average annual rate of 4.0 percent. Figures for 1980 (not yet available) will show a higher per capita income level, but inflation has trimmed the difference between the Alaskan and national standards.

Table 2-1
ALASKA ECONOMIC INDICATORS
1970

Earning Sector	Earnings 1/ (Millions $)
Agriculture	18
Mining	-- 2/
Construction	122
Manufacturing	80
Transportation Utilities	111
Trade	135
Finance	31
Services	118
Government	522
Total Earnings	1,137
Population (Thousands)	305
Per Capita Income ($)	4,202 1/
Per Capita Income Relative to the U.S.	1.209

Notes:

1/ 1967 dollars
2/ Laws governing mining prohibit disclosure of earnings.

2.5 MAJOR ELECTRIC ENERGY USERS

The relative proportion of electrical energy consumed during 1978 by the major consumer categories (residential, commercial, and industrial) for representative utilities in Alaska is given in Table 2-2. Electrical energy consumption in the State is fairly evenly divided between the residential and commercial categories. The low rate of consumption in the industrial category reflects the relatively low level of heavy industrial activity in Alaska.

Table 2-2
ALASKA ELECTRICAL ENERGY CONSUMPTION BY CONSUMER CATEGORY FOR 1978

	Residential	Commercial 1/	Industrial 2/	Other 3/
GWh	1,164	1,295	56	87
Percent	44.7	49.8	2.2	3.3

Source: Edison Electrical Institute.

Notes:

1/ Small light and power.
2/ Large light and power.
3/ Includes street and highway lighting (13 GWh), other public authorities (65 GWh), railroad and railways (2 GWh), and interdepartmental use (7 GWh).

2.6 FUTURE DEVELOPMENT

Population

Table 2-3 summarizes the significant demographic and economic projections for Alaska, as approximated for BEA economic area 172. The projections are based on the 1972 Office of Business and Economic Research and Statistics (OBERS) projections. The OBERS projections forecast an average annual population growth rate of about 1.6 percent between 1980 and 1990, then 1.1 percent to the year 2000.

Commercial and Industrial Development

The largest portion of Alaska's earnings is likely to be generated from the the government sector, which is expected to supply about 40 percent of the region's total earnings in 2000. The mining sector, although small in magnitude, has the largest portion of national earnings compared to other Alaska industrial sectors. Total earnings in Alaska are expected to grow about 3.7 percent annually between 1980 and 2000.

Per capita income in Alaska is expected to be much higher than the national average. In 1980, the Alaska per capita income is likely to be 18 percent above the national average, and decrease to 14 percent above in the year 2000. Overall growth in Alaska per capita income is expected to be about 2.6 percent in constant dollars between 1980 and 2000.

Table 2-3
OBERS PROJECTION OF POPULATION, INCOME, AND MAJOR SECTOR EARNINGS, (ALASKA)
Income and Earnings in Constant 1967 Dollars

Sector	Year 1980	1985	1990	2000
	(Earnings, million $)			
Agriculture	21	23	24	29
Mining	46	56	68	90
Construction	180	211	247	332
Manufacturing	115	135	159	215
Transportation Utilities	176	215	262	381
Trade	192	229	273	386
Finance	54	69	87	135
Services	204	263	339	542
Government	724	862	1,026	1,447
Total Earnings (Million $)	1,713	2,064	2,487	3,557
Total Personal Income (Million $)	1,875	2,289	2,795	4,088
Total Population (Thousands)	333	361	391	438
Per Capita Income ($)	5,626	6,340	7,145	9,333
Per capita Income Relative to U.S.	1.18	1.17	1.16	1.14

Note:

Sum of sector earnings may not equal the total because of discrepancies in OBERS data.

Chapter 3
EXISTING ENERGY

3.1 TRANSMISSION SYSTEMS

The major electrical transmission systems in Alaska are in the Southcentral (Anchorage-Cook Inlet), Southeast (Juneau), and Yukon (Fairbanks-Tanana Valley) subregions. The remainder of the State's transmission systems are isolated, and serve local towns, villages, and nearby environs.

The largest load concentration is in Southcentral Alaska which includes the Greater Anchorage Area, Matanuska Valley and the Kenai Peninsula. Power resources for these load centers are in the Beluga and Kenai natural gas fields. The Eklutna and Cooper Lake hydropower projects also serve this area. This region has a number of smaller isolated power systems with low voltage circuits.

The second largest load center is loacted in the Yukon subregion. The main source of power is furnished by coal burning steam plants in Healy and Fairbanks. Oil-fired combustion turbines in Fairbanks and North Pole furnish the remainder. Diesel plants at Fairbanks and Healy supply standby power.

In Southeast Alaska separate power systems serve each community. Most of the transmission in this area is from hydropower plants to the various load centers. Hydropower is an important source of supply for Juneau, Metlakatla, Pelican, Petersburg, Sitka, and Skagway. Diesel electric plants augment the local electrical system. Transmission grid systems are limited or nonexistent between these communities. The majority of the State's population is urban and power systems are isolated, with service generally confined to the immediate area. The developed areas with complete electrical service occupy less than 5 percent of the State's area.

The Alaska Village Electric Cooperative (AVEC) was organized for the purpose of providing electrical service to the remote native villages under a plan developed through the efforts of the Rural Electrification Administration (REA), the Office of Economic Opportunity, the Bureau of Indian Affairs, the U.S. Department of Labor, and the State of Alaska. AVEC now serves some 14,000 people in 48 remote villages where regular electrical service was not available or adequate only 5 years ago. Most villages have populations of 100 to 500. Each village owns the cooperative and provides rights-of-way, powerplant sites, and operators. Local diesel plants furnish power directly to distribution lines serving the many small communities and villages.

A total of 1,037 miles of transmission lines at 33 kV and above are presently installed in Alaska as shown in Table 3-1. Table 3-2 shows a summary of transmission lines by region.

Table 3-1
EXISTING TRANSMISSION LINES-33 kV AND ABOVE

Nominal Line Voltage		Ownership	
Voltage	Circuit Miles	Type	Circuit Miles
138 kV	303	Cooperative	886
115 kV	348	Municipal	63
69 kV	161	Federal	88
33 kV	225		1,037
	1,037		

Table 3-2
TRANSMISSION LINES AND MAJOR INTERCONNECTIONS, ALASKA, 1979/1

Region	Voltage Level	Line Length
	(kV 2/)	(miles)
Anchorage-Cook Inlet Area	138	128 Overhead
(and Kodiak)	138	12 Submarine
	115	348 Overhead
	69	86 Overhead
	33	153 Overhead
	13.8/69	4 Overhead
Total		731
Fairbanks Area	138	119 Overhead
	69	71 Overhead
	33	42 Overhead
Total		232
Southeast Region	138	41 Overhead
	183	3 Submarine
	33	30 Overhead
Total		74
Alaska - Total	138	288 Overhead
	138	15 Submarine
	115	348 Overhead
	69,13.8/69	161 Overhead
	33	225
Total		1,037

Sources: Alaska Public Utilities commission and Alaska Power Administration.
Notes:
1/ Lines under 33 kV not included.
2/ Nominal voltage.

3.2 DESCRIPTION OF EXISTING ENERGY SYSTEMS EXCLUDING HYDROPOWER

Type of Energy and Magnitude

As of 1979 the installed electrical generating capacity in Alaska was 1,866.8 megawatts. About 84 percent of the electricity generated in the State was produced from energy supplied by fossil fuel. Natural gas was by far the major fuel, accounting for 56 percent of the year's output. Next came oil (18 percent), coal (10 percent), hydro (10 percent), and wood waste (6 percent). Most recent additions have been in oil and natural gas-fired plants with a strong trend toward dependency on these fuels. In 1979, more than 4.8 billion kilowatt-hours of electricity (4,380 GWh thermally) were generated in the State. The combustion turbine, fired by gas or oil, accounts for the largest portion of the thermal generation (60 percent) followed by the steam turbine (24 percent) and internal combustion diesel generator (16 percent). Table 3-3 presents a summary of the net electrical energy produced in 1979 by types of generation for the six subregions in the State.

Fossil-fueled, thermal-electric powerplants have, for many years, been the mainstay of Alaska's elelctrical power industry. Nearly all new installed capacity in the Railbelt area has been combustion turbine units. This includes new oil-fired units installed in Fairbanks and several relatively new natural gas-fired units added by the Anchorage area utilities. In addition, there are a number of new combustion turbine units in industrial applications in various parts of the State.

The increased use of combustion turbines reflects the advantages of low initial equipment cost, minimum ordering and installation lost time, and technological advances. The principal advantage in the Anchorage area, until recently, was the availability of low cost natural gas for fuel. Additional advantages for Alaska are increased capacity and efficiency of combustion turbines because they operate at low altitudes and with low annual average air inlet temperatures.

The efficiency of combustion turbine units is considerably lower than for conventional steam, but options do exist to improve their efficiencies. These include regenerative cycle units, and waste heat boilers in conjunction with steam and combustion turbine units to form combined cycle plants. Two combined cycle units will soon go on line in Alaska. Future combustion turbine units will have higher firing temperatures which increases their efficiencies and in turn increases the efficiencies of future regenerative and combined cycle units.

Approximately 49 percent of the total State thermal generating capacity is located in the Southcentral subregion. A further breakdown shows that 74 percent of this subregion's thermal capacity is produced by combustion turbines. About 23 percent of the State's total thermal capacity is in the Yukon area of which 29 percent is steam-electric. Systems in Southeast Alaska are a mix of diesel, hydropower, and industrial wood waste-fired steam plants. The rest of the State's power systems (except for Barrow) are completely dependent on diesel generation. Generating units in utility steam-electric plants range in size from 500 to 25,000 kilowatts. Steam-electric generating units in national defense plants vary in size from 500 to 7,500 kilowatts.

Table 3-3
SUMMARY OF ALASKA ENERGY GENERATION (GWh)-1979

	Region						
Type of Energy	Southeast	Southcentral	Yukon	Arctic/ Northwest	South-West	Misc.	Total
Gas	0.0	2,260.1	0.0	442.7	0.0	0.0	2,702.8
Oil	86.5	235.8	202.5	81.6	163.7	94.5	864.6
Coal	0.0	0.0	506.5	0.0	0.0	0.0	506.5
Hydro	263.9	192.2	0.0	0.0	0.0	0.0	456.1
Pulp	306.0	0.0	0.0	0.0	0.0	0.0	306.0
Total subregion	656.4	2,688.1	709.0	524.3	163.7	94.5	4,836.0
Type of Facility							
Combustion Turbine	0.0	2,015.1	152.7	454.4	0.0	0.0	2,622.2
Internal Combustion	86.5	240.6	49.1	69.9	163.7	94.5	704.3
Steam Turbine	306.0	240.2	507.2	0.0	0.0	0.0	1,053.4
Total Thermal	392.5	2,495.9	709.0	524.3	163.7	94.5	4,379.9

Source: Alaska Power Administration.

Combustion turbine units were first installed by Alaska utilities in 1962 for baseload operation as well as for peaking. Combustion turbine plants are presently operating to serve most of the load in the Anchorage area but are primarily used for intermediate and peaking purposes in the Fairbanks area. Unit sizes vary from 750 to 72,900 kilowatts. The largest single generating station in Alaska is the Beluga plant located on the west side of the Cook Inlet. The plant, which consists entirely of combustion turbines, has a total capacity of 298,100 kilowatts. Internal combustion engine (diesel) generating plants are scattered throughout the State and are used exclusively in the isolated areas of the Southwest, Northwest, and Arctic subregions. Plants vary widely in size and number of units. Individual units of 6,450 kilowatts are in operation, but the average size is in the range of several hundred kilowatts.

Future Potential

The Southcentral Region, particulary the Anchorage-Cook Inlet area, has the widest variety of thermal alternatives with natural gas, coal, and oil available in close proximity. Natural gas in the Anchorage-Cook Inlet area has been the least expensive fossil fuel in the State, and relatively low-cost power supplies are assured as long as low-cost natural gas is available for power production. However, there is genuine doubt that adequate natural gas reserves exist to supply sufficient energy to meet total power requirements through 2000. Several experts are of the opinion that natural gas will be either unavailable or too costly for power production beyond 1985. This is due partly to skepticism concerning estimates of natural gas reserves and partly because of national economic factors. There may be better uses of natural gas (e.g., petrochemical uses and home space heating) than generation of electrical power, especially when extensive coal deposits are available.

Large steam-electric plants have lower per-kilowatt costs than smaller ones; but existing and immediate future forecasted electrical power requirements in Alaska load areas indicate there is no need for large units. In comparison with plants of comparible size now in service, higher capital costs and longer lead times required for coal, oil, and gas-fired steam-electric plants indicate that oil or natural gas-fired combustion turbines and combined cycle plants will be built to meet future power requirements until at least 1984. Utilities are seriously considering sizeable combustion turbine and/or combined cycle installations to be added within the next 5 years. Combustion turbine unit sizes will range from 60 to 70 megawatts and a combined cycle plant would range from 100 to 200 megawatts. Industry will most likely continue to add smaller size (20-35 MW) combustion turbine and/or diesel units. Based on the estimated mid-range power requirements, it appears that a baseload coal-fired steamplant in the 300-500 megawatts size range could be utilized in the Anchorage area by 1985.

For the Yukon subregion, the range of thermal alternatives is essentially the same as for the Southcentral subregion except for the present use of natural gas as fuel in the latter subregion. Coal-fired plants are now being planned to meet Fairbanks area utility loads of 1983 and beyond. Vast coal deposits in the Nenana field could provide adequate fuel to meet all of the subregion's future power requirements. However, until 1985 the subregion's utilities will probably continue to add combustion turbine units and possibly, if warranted, combined cycle units.

Alterntives for the Fairbanks area electrical system include the possibility of using oil or natural gas from the Alaska pipeline or from the proposed natural gas pipeline. Some refining would be needed, however, to produce suitable fuel for any type powerplant. For smaller power systems in the Southcentral and Yukon subregions, no economical alternatives to diesel generation have been identified to date.

Outside the Southcentral and Yukon subregions there are fewer options. Oil-fired diesel electric powerplants are expected to continue as the main source of electricity and in some areas are the only available source for most power systems. Controlling factors which preclude other thermal alternatives include:

(a) No access to alternate fossil fuels.

(b) Small-size power market.

(c) The large investment required for conventional steam-electric plants. It should be noted that small coal-fired plants have received consideration recently, but are not likely to be economically feasible because of the extremely high investment costs for small capacity units.

There are no active nuclear powerplants in Alaska, and nuclear power is not currently a factor in Alaska power planning, primarily due to the relatively small power requirements and the availability of other attractive alternatives. Large nuclear powerplants would not likely fit the State power system needs until beyond 2000, unless loads develop substantially higher than present forecasts.

There is considerable interest in Alaska's geothermal potential, and good reasons exist to explore and define this resource and to proceed with development. Two areas in Alaska are classified as "known geothermal resources areas:" the Pilgrim Springs of the Seward Peninsula, and an area on the Aleutian Chain. These and other areas which are thought to have relatively high potential are, however, remote from major load centers. The Seward Peninsula geothermal potential is the most promising of the two areas and may eventually prove usable if potential mining loads materialize, or if other electrical power requirements build to a size warranting a regional power system.

Of the possible other electrical energy sources thought to be available in the future, wind power may have some applications in Alaska. The opportunity to displace high cost fuels increases the attractiveness of such an alternative. The present state-of-the-art of wind power embraces mainly applications for small remote installations, but there are conceptual plans for sets of very large wind generators to be used for major energy supplies. The most likely near term future application of wind power for Alaska appears to be as a supplement to diesel power for remote villages or industrial sites where suitable wind conditions exist, and alternative generation options are limited. Responsible officials do expect interest to increase in wind generation and also expect several wind demonstration projects within the next few years.

There is, at present, little basis for assuming solar power will be a significant alternative for Alaska power systems in the future. Incoming radiation levels in the northerly latitudes are comparatively low, especially in winter when energy demands are the highest. Solar power is generally thought to be impractical for Alaskan electrical generation but may be a consideration in new residential construction where energy conservation measures are being emphasized.

Other potential sources of power in Alaska include wood and tidal power. Although Alaska is endowed with an abundant source of wood, presently the high cost of collecting and handling the large volumes required makes wood uneconomical as a fuel for generating electricity in comparision to conventional fossil fuels. The Cook Inlet tidal range is one of the world's largest and could be a significant source of power. Because of the availability of more cost-competitive energy sources, the large size of the project, and technical problems requiring solution, tidal power remains a distant alternative energy source.

Impacts

In the contiguous 48 states the adverse effects of thermal and air pollutants from electric power plants have been well documented. One significant problem in Alaska is the occurrence of ice fog in the Fairbanks area during the winter caused by increased atmospheric moisture rising from the local steam generating plant and other sources. Due to the low level of development in Alaska, other short-term environmental problems resulting from electrical generating plants are minor or unidentified. To date, monitoring of air and water quality has been limited. If the future baseload electrical generation is met largely by thermal generation means, the State will be faced with very significant environmental problems characteristic of those in the contiguous 48 states. The State of Alaska, recognizing this, has included measures to protect the environment as a primary objective in plans involving power plant developments.

Ownership

The electrical power industry in Alaska is composed of a plurality of utility systems: some owned by private companies, some owned by governmental agencies (Federal or municipal), and some owned by electrical cooperatives (sponsored by REA). In addition to the utility power systems, there are numerous self-supplied (non-utilities) industrial and national defense power systems in the State. Table 3-4 lists Alaskan utilities, indicates type of ownership, and gives the utility designation.

Table 3-5 compares type of ownership of utility systems based on systems of record in 1979. As shown in this table, the largest number of utilities are in the private group. However, in 1979, 67 percent of the more than 140,000 retail customers in Alaska were served by Alaska's 14 cooperatively owned systems while only 8 percent were served by private utilities. By way of contrast, the private sector in the contiguous 48 states serves more than 75 percent of the retail customers. During the 1965-1975 period, however, the total number of electrical utility systems in the contiguous 48 states decreased; the total number of Alaska's utilities increased during this same period.

Table 3-4
ALASKA UTILITY SYSTEMS

Designation	Utility	Type of Ownership
AMFI	Amfac Foods, Inc.	Private
ALEL	Alaska Electric Light and Power Company	Private
ANCO	Anchorage Municipal Light and Power Dept.	Municipal
APAD-E	Alaska Power Administration-Eklutna (Anchorage)	Federal
APAD-S	Alaska Power Administration-Snettisham (Juneau)	Federal
APCO	Aniak Power Company	Private
APTC	Alaska Power & Telephone Company (4 towns)	Private
AVEC	Alaska Village Electric Cooperative, Inc. (48 villages)	Private Cooperative
ARVI	Arctic Utilities, Inc.	Private
BAUI	Barrow Utilities and Electric Cooperative Inc.	Cooperative
BUCI	Bethel Utilities Corporation, Inc.	Private
BLPI	Bettles Light & Power, Inc.	Private
CIEL	Circle Electric	Private
CHEA	Chugach Electric Association, Inc.	Cooperative
COMA	City of Manakotak	Municipal
COUU	City of Unalaska	Municipal
COEC	Cordova Electric Cooperative, Inc.	Cooperative
CRTP	Chistochina Trading Post	Private
CVEA	Copper Valley Electric Association, Inc.	Cooperative
FACO	Fairbanks Municipal Utilities System	Municipal
FYUI	Fort Yukon Utilities	Private
GHEA	Glacier Highway Electric Association, Inc.	Cooperative
GOVE	Golden Valley Electric Association, Inc.	Cooperative
HOEA	Homer Electric Association, Inc.	Cooperative
HUGH	Hughes	Private
HLPC	Haines Light and Power Co., Inc.	Municipal
KECO	Ketchikan Public Utilities	Municipal
KOEA	Kodiak Electric Association, Inc.	Cooperative
KTEA	Kotzebue Electric Association, Inc.	Cooperative
KLEV	Klukwan Electric Utility	Municipal
LBES	Larsen Bay Electric System	Private
MEAI	Matanuska Electric Association, Inc.	Cooperative
MUCI	Manley Utility Co., Inc.	Private
MPLM	Metlakatla Power and Light	Municipal
MDEP	M & D Enterprise	Private

Table 3-4(cont)

Designation	Utility	Type of Ownership
NEAI	Naknek Electric Association, Inc.	Cooperative
NECI	Nushagak Electric Cooperative Inc.	Cooperative
NLPU	Nome Light and Power Utilities	Municipal
NPEC	Northern Power & Engineering Corporation, Inc.	Private
NPLI	Northway Power & Light, Inc.	Private
NKPI	Nikolski Power & Light Co.	Private
NSRP	North Slope Borough Power and Light System	Municipal
PALI	Paxson Lodge, Inc.	Private
PMLP	Petersburg Municipal Light and Power	Municipal
PUCO	Pelican Utility Company	Private
SESM	Seward Electric System	Municipal
SESU	Semloh Supply (Lake Minchumina)	Private
SIPU	Sitka Electric Department	Municipal
TLPC	Teller Power Company	Private
TPCO	Tanana Power Company	Private
THRE	Tlinget-Haida Regional Electric Authority Cooperative	Municipal
WRLD	Wrangell Municipal Light & Power	Muncipal
WTCO	Weisner Trading Co.	Private
YAPI	Yakutat Power, Inc.	Private

Table 3-5
ELECTRIC UTILITY SYSTEMS, PRINCIPAL OPERATIONS AND RETAIL CUSTOMERS BY OWNERSHIP SEGMENT
Systems of Record-1979

Ownership	Total Systems	Systems with Generation: Transmission and Distribution	Systems with Generation: Transmission and Wholesaling	Generating Capacity (Percent of Total)	Number Engaged in Distribution Only	Retail Customers Served (Number)	Retail Customers Served (Percent)
Private	25	25	0	4.9	0	11,500	8.1
Municipal	13	13	1	28.8	0	35,300	25.0
Cooperative 1/	14	14	2	60.0	0	94,700	66.9
Federal	1	0	1	6.3	0	0	0.0
Total	53	52	4	100.0	0	141,500	100.0

Note: 1/ AVEC is listed as one system.

Table 3-6 shows the relative sizes of electrical utility systems, by type of ownership, for 1979. In 1979 seven utilities--two of which are municipals, four cooperatives, and one Federal--had energy requirements in exess of 100 million kilowatt-hours and one of these exceeded 600 million kilowatt-hours. The requirements of four others ranged between 25 and 99 million kilowatt-hours in 1979.

Table 3-6
OWNERSHIP OF UTILITY SYSTEMS BY SIZE OF TOTAL ENERGY REQUIREMENTS
Systems of Record-1979

Ownership	Number of Systems - Annual Energy Requirements: Over 100 GWh	25-99 GWh	1-24 GWh	Under 1 GWh	Total
Private	0	1	14	10	25
Municipal	2	2	6	3	13
Cooperative 1/	4	1	8	1	14
Federal	1	0	0	0	1
Total	7	4	28	14	53

Note: 1/ AVEC is listed as one system.

3.3 ROLE OF EXISTING HYDROPOWER

Most of the early hydropower developments in Alaska were constructed to provide power for mining and other industrial uses, such as fish processing and were often associated with hydromechanical installations. Over the years, many small hydropower installations were constructed in Southeastern Alaska to serve local and seasonal needs. Some of these still remain in service today, although most small installations have been replaced by diesel generators.

The largest existing hydropower installation in the State is the Snettisham project at Long Lake, 28 miles southeast of Juneau. This project, constructed by the Corps of Engineers and operated by the Alaska Power Administration, began operation in 1973 with an initial installation of 47,160 kilowatts. Ultimate capacity planned for the Snettisham project is 74,160 kilowatts. The Alaska Power Administration also operates the 30,000-kW Eklutna plant, 32 miles north of Anchorage. The third largest hydropower installation in the State is the 15,000 kW Cooper Lake plant owned by Chugach Electric Association, Inc. and located on the Kenai Peninsula, about 60 miles southeast of Anchorage.

There are more than 40 hydropower installations in Alaska, ranging in size from 1.5 to 47,160 kilowatts. Most of the plants are small and only of local significance. Only 14 plants are large enough and in locations to have an impact on the future power supply of the State. These plants are listed in Table 3-7 and their locations are shown on Figure 3-1. Twelve of these plants are located in Southeastern Alaska and serve the cities of Juneau, Ketchikan, Petersburg, Sitka, and Skagway and the communities of Metlakatla and Pelican. The other two plants are in Southcentral Alaska and are part of the interconnected system serving the Anchorage-Cook Inlet area. There are no hydropower plants located in the Arctic, Northwest, Yukon or Southwest subregions.

All major hydropower developments in recent years have been made by public entities. Of the five plants built in the last three decades, the two largest, with a total capacity of 77,160 kilowatts or nearly two-thirds of the Alaskan hydropower capacity, are Federally owned and operated.

In Southeast Alaska, power is primarily generated by diesel generators or a mix of diesel generators supplementing hydroelectric power when available such as in Juneau and Ketchikan. Only the Juneau area has hydropower capacity in excess of present demands. All of the hydropower generated in Southeast Alaska is used locally. There are no interties between communities; however, interties are being considered.

In Southcentral Alaska, the primary service areas are supplied baseload power generated principally by natural gas-fired combustion turbines. Intermediate and peaking power are provided by the principal hydropower projects, Cooper Lake and Eklutna.

Table 3-7
EXISTING HYDROELECTRIC PLANTS, ALASKA
January 1979

System	Plant Name (FPC Project No.)	Location	Capacity (kW)	Ownership	Year of Initial Operation
Southeast Region					
Alaska Elec. Light & Power Co.	Gold Creek	Juneau	1,600	Private	1914
Alaska Elec. Light & Power Co.	Annex Creek (2307)	Juneau	3,500	Private	1916
Alaska Elec. Light & Power Co.	Upper Salmon Cr. (2307)	Juneau	2,800	Private	1913
Alaska Elec. Light & Power Co.	Lower Salmon Cr. (2307)	Juneau	2,800	Private	1914
Alaska Power & Telephone Co.	Dewey Lakes (1051)	Skagway	480	Private	1902
Pelican Utility Co.	Pelican Creek	Pelican	500	Private	1943
Ketchikan Public Utilities	Ketchikan Lakes (420)	Ketchikan	4,200	Public	1923
Ketchikan Public Utilities	Beaver Falls	Ketchikan	5,000	Public	1947
Ketchikan Public Utilities	Silvis (1972)	Ketchikan	2,100	Public	1968
Metlakatla Power & Light	Purple Lake	Metlakatla	3,000	Public	1956
Petersburg Mun. Light & Power	Crystal Lake (201)	Petersburg	2,000	Public	1955
Sitka Public Utilities	Blue Lake (2230)	Sitka	6,000	Public	1961
Alaska Power Administration	Snettisham	Speel River (Juneau)	47,160	Federal	1973
Southcentral Region					
Chugach Elec. Assn., Inc.	Cooper Lake (2170) (Kenai)	Cooper Landing	15,000	Public NonFederal	1961
Alaska Power Administration	Eklutna	Eklutna (Anchorage)	30,000	Federal	1955
		Total	126,140		

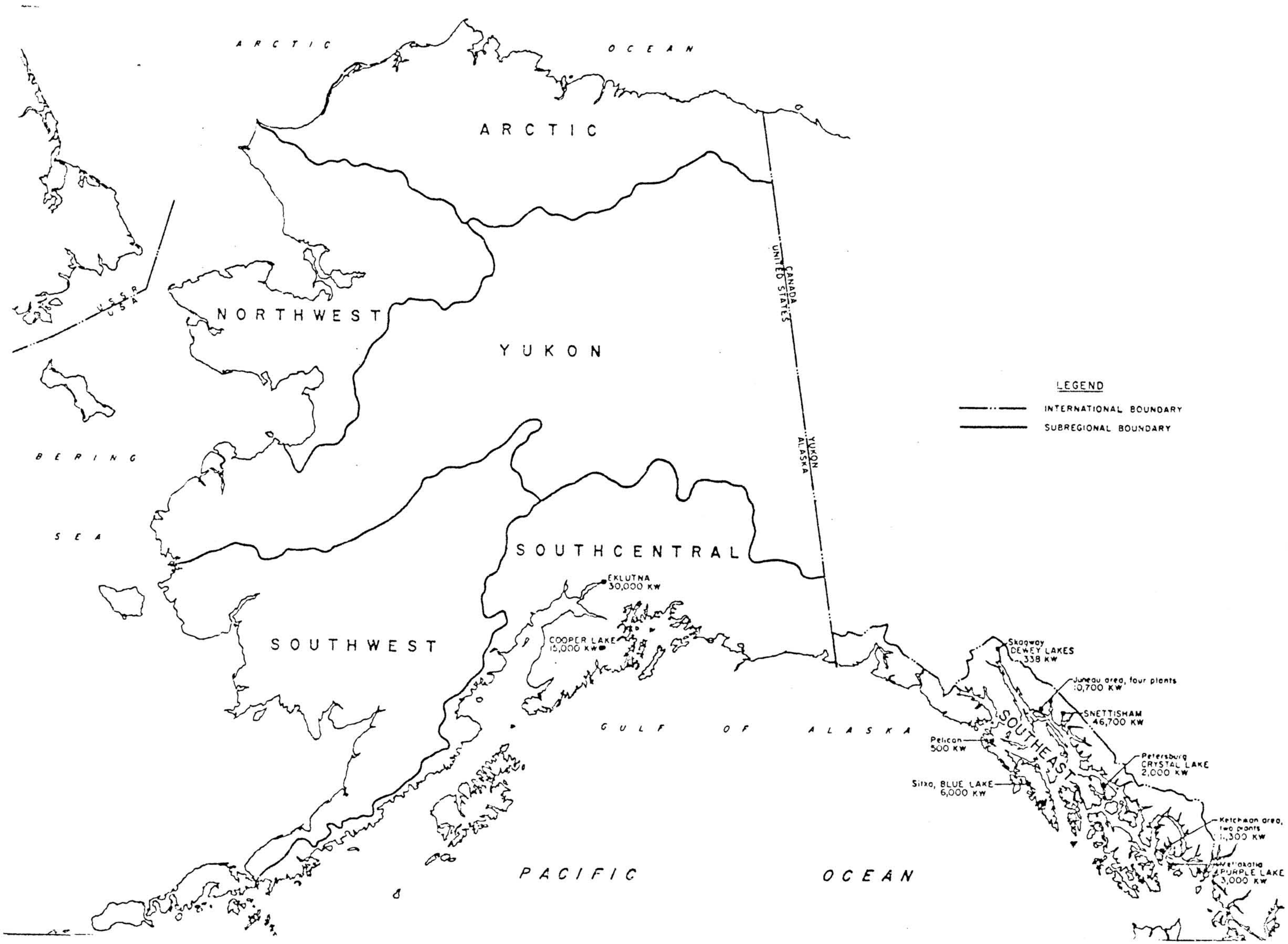


Figure 3-1
EXISTING HYDROPOWER PLANTS, ALASKA

Several hydropower projects are currently under consideration in Alaska. The proposed Upper Susitna Dam Project, as currently envisioned, would have a total generating capacity of 1,558 megawatts and would exceed the combined existing State hydropower capacity by more than 13 times. Other hydropower projects under detailed study or construction with a capacity of 1 MW or greater include:

Community Served	Hydropower Site	Installed Capacity (MW)
Ketchikan	Upper Mahoney	10
	Swan Lake	15
	Chester Lake	2.5
Petersburg/Wrangell	Tyee	30
Wrangell	Thomas Bay	50
Sitka	Green Lake	16.5
Juneau	Upper Salmon Creek (Rehabilitation)	15
Klawock/Craig	Black Bear Lake	5
Haines/ Skagway	West Creek	5
Southcentral		
Cordova	Power Creek	7
Homer	Bradley Lake	90
Kodiak	Terror Lake	20
Valdez	Allison Creek	8
	Solomon Gulch	12
Southwest		
Bethel	Kisaralik River	30
Dillingham	Lake Elva	1
Bristol Bay	Tazimina	18

There are no proposals to develop hydropower in the Arctic, Yukon and Northwest subregions of Alaska.

Chapter 4
DEMAND SUMMARY

4.1 ELECTRIC UTILITY DEMAND - PRESENT CONDITIONS

Delineation of Regional Power Systems

In this study, Alaska is considered an independent region since it is not directly tied into the interconnected electric system of any other state. For purposes of discussion the State is divided into the six major subregions shown on Figure 2-1.

Peak Demand and Energy Use

The noncoincidental peak load and energy use for the major Alaska utilities in 1979 was about 581 megawatts and 2,700.2 million kilowatt-hours (308.2 average megawatts) respectively (Table 4-1). These utilities represent about 75 percent of the total statewide demand. The peak demand increased at an average annual growth rate of 11.4 percent over the 1965-1979 period, from 127.6 megawatts in 1965 to 580.8 megawatts in 1979. Within this period the growth rate in peak demand from 1970 to 1975 was 14.1 percent, increasing from 234.4 megawatts to 453.2 megawatts. Energy use increased at an average annual growth rate of 11.6 percent over the 1965-1979 period, from 578.5 Million kilowatt-hours (66.0 average megawatts) in 1965 to 2,700.2 million kilowatt-hours (308.2 average megawatts) in 1979. The use in 1970 was 1,043.9 million kilowatt-hours (119.2 average megawatts) and 1,978.3 million kilowatt-hours (225.8 average megawatts) reflecting an average annual growth rate of 13.6 percent for the period 1970-1975. Table 4-2 shows annual growth rates in energy consumption for residential, commercial, and industrial customers for the period 1965-1978.

Load Characteristics

Alaska is a winter peaking region. Mean annual temperatures range from 43 degrees F in the southern areas to 10 degrees F in the northernmost Arctic areas. Table 4-3 shows the peak demand as a percentage of the annual peak as well as the weekly load factors for the first week in April, August, and December 1977 of five utilities representing the principal bulk power suppliers in Alaska. These utilities are the following: the Fairbanks Municipal Utility Systems in the Yukon subregion, the Chugach Electric Association and Kodiak Electric Association in the Southcentral subregion, the Sitka Electric Department in the Southeast area, and the Golden Valley Electric Association (Yukon). Hourly load and load duration curves for the first week in April, August, and December for Chugach Electric Association, Inc. are shown in Figure 4-1.

Table 4-1
ANNUAL DEMAND, PEAK DEMAND AND LOAD FACTOR, ALASKA/1

Calendar Year	Annual Energy 2/ GWh	Average Annual Growth Rate-% 1 yr	Average Annual Growth Rate-% 5 yr	Dec. Peak Demand Peak MW	Average Annual Growth Rate-% 1 yr	Average Annual Growth Rate-% 5 yr	Load Factor Factor - %
1965	578.5	-	-	127.6	-	-	51.8
1966	647.6	11.9	-	140.5	10.1	-	52.6
1967	711.9	9.9	-	149.3	6.3	-	54.4
1968	798.3	12.1	-	182.9	22.5	-	49.7 3/
1969	895.5	12.2	-	185.6	1.5	-	55.1
1970	1,043.9	16.6	12.5	234.4	26.3	12.9	50.8
1971	1,239.9	18.8	13.9	263.0	12.2	13.4	53.8
1972	1,404.3	13.3	14.6	288.4	9.7	14.1	55.4 3/
1973	1,548.3	10.3	14.2	294.7	2.2	10.0	60.0
1974	1,670.3	7.9	13.3	345.2	17.1	13.2	55.2
1975	1,978.3	18.4	13.6	453.2	31.3	14.1	49.8
1976	2,249.3	13.7	12.7	442.0	2.5	10.9	57.9 3/
1977	2,451.0	9.0	11.8	532.6	20.5	13.1	44.2
1978	2,613.5	6.6	11.0	564.2	5.9	13.9	52.9
1979	2,700.2	3.3	10.1	580.8	2.9	11.0	53.1

Source: Alaska Electric Power Statistics, 1960-1976 and Alaska Power Administration files.

Notes:

1/ Utilities considered are from the Southeast, Southcentral, and Yukon Subregions, which represent approximately 3/4 of the total statewide demand.
2/ Annual energy sales.
3/ Load factor based on 8,784 hours.

Table 4-2
ALASKA ANNUAL GROWTH RATES OF ENERGY CONSUMPTION
Percent

Year	Residential	Commercial 2/	Industrial 1/	Total 3/
1965	9.5	9.4	11.5	9.6
1966	9.4	11.9	23.5	12.7
1967	14.9	12.5	0.0	13.3
1968	5.2	5.5	3.6	7.0
1969	13.9	16.4	6.9	13.7
1970	11.5	9.5	7.5	10.3
1971	16.8	12.6	9.0	15.0
1972	3.5	4.5	11.9	5.5
1973	32.2	28.6	17.2	28.2
1974	3.0	3.0	7.0	4.5
1975	9.0	14.0	27.5	7.4
1976	17.8	39.9	68.7	17.0
1977	13.3	18.5	8.2	14.8
1978	4.6	6.4	0.0	5.3

Source: United States Department of the Interior. Alaska Power Administration "Alaska Electric Power Statistics 1960-1976" 4th ed. (July 1977) and EEI Statistics.

Notes:

1/ Reported in source as "Commercial and Industrial - Large Light and Power"
2/ Reported in source as "Commercial and Industrial - Small Light and Power"
3/ Includes other sectors, in addition to residential, commercial, and industrial.

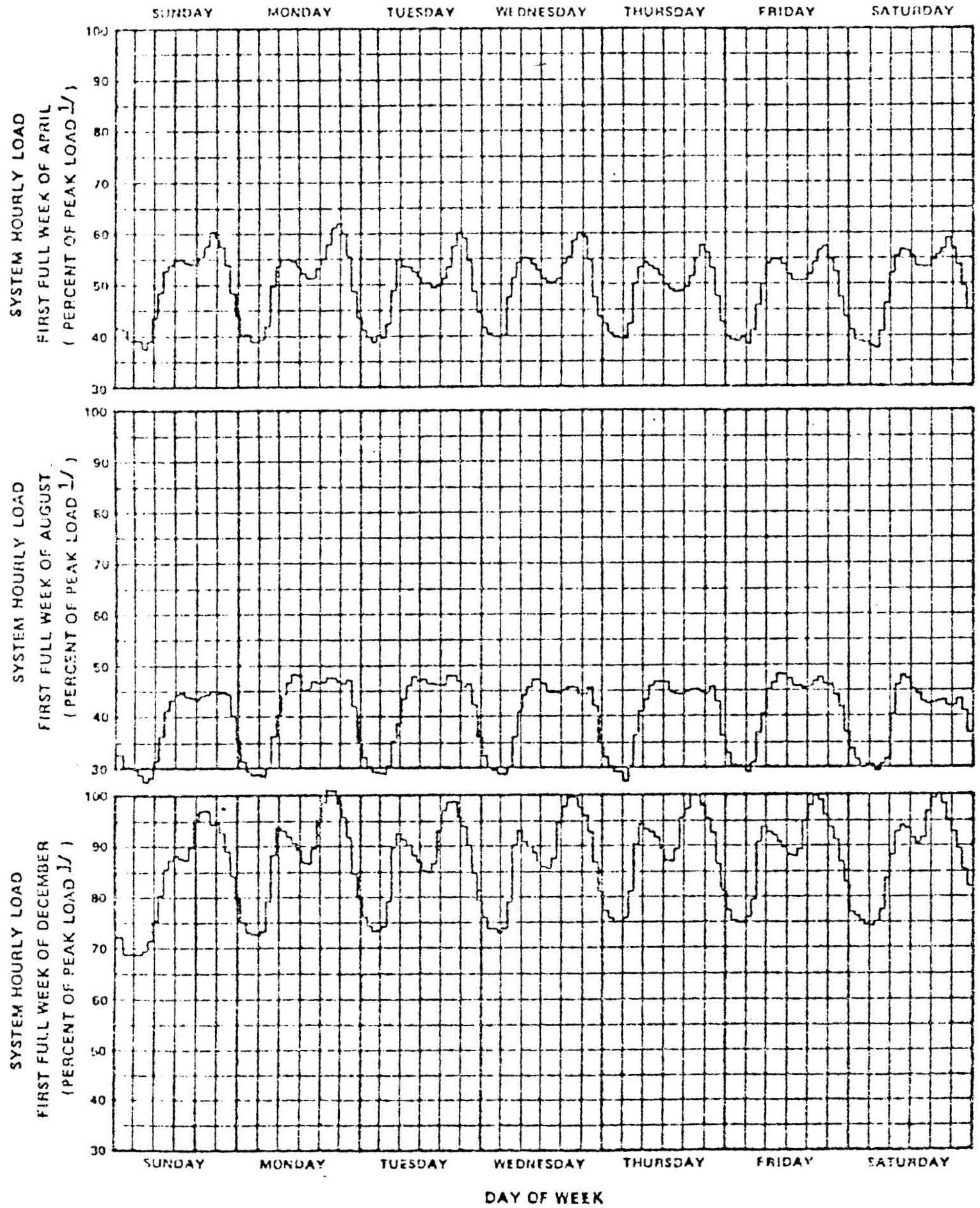
Table 4-3
SYSTEMS LOAD VARIATIONS IN ALASKA/1
1977

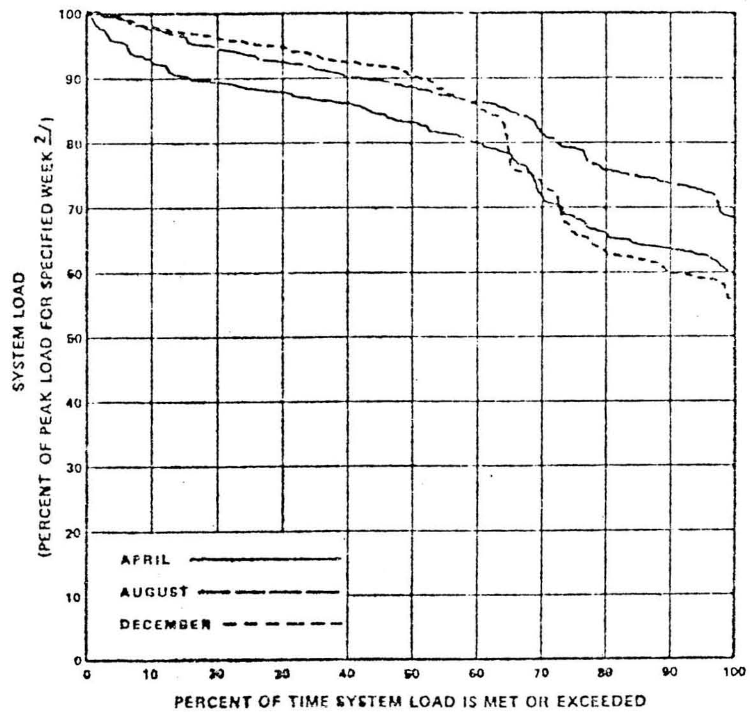
Utility	First Week of April: Peak Demand % of Annual	First Week of April: Weekly Load Factor %	First Week of August: Peak Demand % of Annual	First Week of August: Weekly Load Factor %	First Week of December: Peak Demand % of Annual	First Week of December: Weekly Load Factor %	Annual: Peak Demand MW	Annual: Date	Annual: Net Energy GWh	Annual: Load Factor %
Fairbanks Municipal Utilities System	75.4	76.4	68.1	79.1	94.2	83.7	27.6	Dec 12	128.46	53.1
Chugach Electric Association, Inc.	64.4	78.9	47.0	83.6	97.6	88.1	27.4	Dec 5	1,236.54	51.5
Golden Valley Electric Association, Inc.	54.4	81.4	38.8	77.9	91.4	87.1	89.9	Dec 13	353.14	45.0
Kodiak Electric Association, Inc.	NA	NA	80.2	NA	90.1	NA	10.1	Nov 5	53.6	60.6
Sitka Electric Department	NA	NA	NA	NA	NA	NA	8.1 2/	Nov 29	44.0	NA

Notes:

1/ Computations based on data from schedules 14 and 15 of 1977 FERC - Form 12.
2/ Does not include December 1977.

Figure 4-1
SEASONAL HOURLY LOADS, CHUGACH ELECTRIC ASSOCIATION,ALASKA





NOTES:

1 PEAK LOAD IS EQUAL TO THE LARGEST SYSTEM LOAD IN THE FIRST FULL WEEK OF APRIL, AUGUST, AND DECEMBER.

2 PEAK LOAD IS THE PEAK SYSTEM LOAD FOR THE CORRESPONDING WEEK FOR THE APRIL, AUGUST, OR DECEMBER CURVES.

SOURCE:

DATA OBTAINED FROM FERC FORM NO. 12 (SCHEDULES 14 AND 15) FOR 1977.

Load Resource Analysis

The estimated generating capability, peak demand, and reserve margin for the entire Alaska Region as well as the major areas in the State are given in Table 4-4.

Demand-Supply Balance

The winter peak demand (noncoincident peak) for Alaska utilities was 662 megawatts in 1978 with 463 megawatts or 70.0 percent being contributed by the Southcentral area. The Southeast area accounted for 11.5 percent (76 MW), the Yukon accounted for 15.3 percent (101 MW); and the Southwest, Northwest, and Arctic areas combined accounted for only 3.3 percent (22 MW).

Imports and Exports

As previously mentioned, there are no transmission lines between any of the major geographic areas in Alaska. Thus, there is no importing or exporting of power between the different areas. Alaska is also isolated from the Canadian Power System, and except for Hyder (Southeastern Alaska), power is not transferred into or out of the Alaska Region.

Reserve Margins and Regional System Reliability

Presently, electrical resources in Alaska exceed demand requirements by 475 megawatts or 41.9 percent. However, since there are no interconnections between the major geographical areas in the State, it is more meaningful to consider the reserve margins on an area-by-area basis. Reserve margins for the major geographical areas ranged from a low of 28.0 percent in the Southcentral subregion to a high of 65.6 percent in the Yukon as shown in Table 4-4.

Table 4-4
ALASKA ESTIMATED RESOURCES, DEMAND AND RESERVE MARGINS/1
1978

	Generating Capacity (MW)	Peak Demand (MW)	Reserve Margin (MW	
				%
Alaska	1,137	662	475	41.9
Southeast	150	76	74	49.3
Southcentral	643	463	180	28.0
Yukon	294	101	193	65.6
Southwest, Northwest Artic Combined	50	22	28	56.0

Note:

1/ Utilities only. Military and industrial sources are not considered.

4.2 ELECTRICAL ENERGY DEMAND - FUTURE CONDITIONS

In considering the future demand for electricity, two separate forecasts were evaluated: one developed by Harza Engineering Company for the Institute for Water Resources, U.S. Army Corps of Engineers (Harza forecast); and, one developed by the Alaska Power Administration (APA forecast). Although the Harza forecast was prepared specifically for the NHS, it used standardized procedures developed for use nationwide and does not reflect conditions unique to Alaska. Further, it does not include electricity generated by private industry and utilities or military installations. For these reasons, there are significant differences in the results of the two forecasts as highlighted in the following comparison:

Energy Demand (year)	Harza Forecast (million kWh)	APA Forecast (million kWh)
Current (1978)	2,300	2,966
Future (2000)	7,500	15,000

Since the APA forecast incorporates private and military generation as well as generation by the public utilities and includes detailed consideration of the State's potential for economic development, their data presents a more realistic picture of the future demand for electricity in Alaska. Therefore, the APA forecast is used in this report as the basis for determining the amount of hydropower development which could be utilized to meet the future demand for electricity (chapter 7). The results of both forecasts, however, are discussed for comparison.

Harza Forecast

The Harza forecast was developed from three separate electricity demand projections (Projections I, II, and III) which were derived from readily available information. The most probable (Median Projection) forecast was taken from the three projections simply by selecting the median of the three projections for each point in time condsidered (1978, 1985, 1990, 1995, and 2000). Projection I represents a compilation and extrapolation of projections made by the major utilities in response to an FERC reporting requirement. Projection II was developed by the Institute for Energy Analysis at the Oak Ridge Associated Universities in September 1976. And, Projection III is a "consensus forecast" which was derived by averaging 15 forecasts made by private and Federal economists during the past oil embargo period. With the exception of Projection I, each forecast purports to be conservation oriented. A summary of the results of these projections is shown in Table 4-5.

Peak Demand

Alaska's peak demand is expected to grow from 500 megawatts in 1978 to 1,700 megawatts in 2000, resulting in an average annual growth rate of 5.4 percent over a 22-year period.

Table 4-5
HARZA FORECAST OF ELECTR IC UTILITY POWER DEMAND, ALASKA
(1978-2000)

	1978	7-Year Growth Rate 1/	1985	5-Year Growth Rate 1/	1990	5-Year Growth Rate 1/	1995	5-Year Growth Rate 1/	2000	22-year Overall Growth Rate 1/
Population (thousands)	403.	2.6	483.	1.6	523.	1.1	552.	1.1	583.	1.7
Projection I										
Per Capita Consumption (MWh)	5.6	12.3	12.6	4.2	15.5	5.7	20.5	4.0	24.9	7.0
Total Use (Thousand GWh)	2.3	15.2	6.1	5.8	8.1	6.9	11.3	5.1	14.5	8.8
Peak Demand (GW)	.5	14.6	1.4	5.7	1.8	6.9	2.6	5.1	3.3	8.6
Projection II										
Per Capita Consumption (MWh)	5.6	2.6	6.7	2.6	8.7	2.6	8.7	2.6	9.9	2.6
Total Use (Thousand GWh)	2.3	5.3	3.2	4.2	4.0	3.7	4.8	3.7	5.8	4.3
Peak Demand (GW)	.5	6.6	.8	5.6	1.1	4.4	1.4	4.3	1.7	5.4
Projection III										
Per Capita Consumption (MWh)	5.6	2.6	6.7	2.6	7.6	2.6	8.7	2.6	9.9	2.6
Total Use (Thousand GWh)	2.3	7.2	3.7	5.7	4.9	4.4	6.0	4.3	7.5	5.6
Peak Demand (GW)	.5	6.6	.8	5.6	1.1	4.4	1.4	4.3	1.7	5.4
Median Projection 2/										
Per Capita Consumption (MWh)	5.6	4.5	7.6	4.0	9.3	3.3	10.9	3.2	12.8	3.8
Total Use (Thousand GWh)	2.3	7.2	3.7	5.7	4.9	4.4	6.0	4.3	7.5	5.6
Peak Demand (GW)	.5	6.6	.8	5.6	1.1	4.4	1.4	4.3	1.7	5.4
Margin (Percent)			47.3		50.0		50.0		50.0	
Resources To Serve Demand (GW)			1.2		1.7		2.1		2.6	
Load Factor (Percent)	47.8		49.7		50.0		50.0		50.0	

Notes:

1/ The growth rates are average annual compounded rates over the period.
2/ Referred to in this report is the Harza Forecast.

Load Factor

Alaska presently has the lowest regional annual load factor in the nation. The annual load factor is expected to remain at about its present value of 50 percent through the remainder of the century.

Reserve Margin and System Reliability

Due to the large distance and adverse terrain between load centers, most Alaskan utility systems do not have transmission line interconnections. Thus, the reliability of power within a particular generation system relies primarily on an adequate local reserve margin. For this reason, reserve margins, as presented in Table 4-4 currently range from very low in the Southcentral subregion to high in the Southeast, and are expected to remain so. Studies are currently under way to determine the feasibility of an interconnection between the Southcentral and Yukon subregions, which would tie Anchorage and Fairbanks together. For the purpose of this study, a reserve margin of 50 percent is applied to the "median" peak demand to compute future capacity requirements.

Generation Mix

Table 4-6 shows the Harza-forecasted most probable generation mix for base, intermediate and peaking capacity to 2000 for Alaska. The projected mix is based on existing and planned generation facilities reported by the utilities, characteristics of electric loads, an analysis of regional resource availability, economic parameters, Federal and State regulations, and other pertinent regional factors. To reflect the uncertainties and unforeseeable factors which can affect future generation mixes, a range of future installed capacity is defined for each major generation source. The projected mix is based on the "median" demand and the reserve margins presented in Table 4-5.

In the past, Alaska has relied on combustion turbines as its principal source of electric generation due to their low construction costs and the availability of low-cost natural gas for fuel. However, this trend is expected to change in the future. Many coal-fired plants are now under consideration for the future. In addition, because of higher fuel costs, many small hydropower plants are becoming economical to serve isolated areas. Several small hydropower developments are now under construction or licensing. The Susitna Project, now in the planning stage, could provide a large amount of the Anchorage-Fairbanks electrical needs by the end of the century. Several other smaller hydropower project sites exist and could be economically developed in the future. Although interest has been expressed in a nuclear generating plant for commercial use, it is considered unlikely that such a power plant would be in operation before 2000 due to excessive lead time and economic competition from hydropower and coal-fired energy generation sources.

Table 4-6
ALASKA GENERATION MIX
Percent of Total Capacity

Generation Type	1985 (%)	1990 (%)	1995 (%)	2000 (%)
Base				
Coal	15-18	18-20	20-25	20-25
Oil	12-14	10-12	8-10	5-8
Gas	38-42	34-36	25-27	15-18
Conv. Hydro	2-4	5-10	10-20	20-30
Intermediate				
Coal	2-4	3-5	3-5	3-5
Oil	5-6	4-5	4-5	3-5
Gas	5-6	5-6	4-6	4-6
Conv. Hydro	3-4	3-4	3-8	5-10
Other	0	0-1	0-1	1-2
Peaking				
Oil	34	2-3	2-3	1-3
Gas	3-4	3-4	3-4	2-4
Conv. Hydro	2-3	2-3	4-6	5-10
Other	0	0-1	0-1	1-2
Total Capability (GW)	1.2	1.7	2.1	2.6

Specific Role of Hydropower

With a capacity of 131 megawatts, conventional hydropower represented about 14 percent of the total installed capacity in 1977. Only two small hydropower projects are under construction, Solomon Gulch and Green Lake, although many hydropower sites are available for development. Several studies of small and medium size hydropower developments are under way. The Susitna Project with an estimated capacity of 1,558 megawatts has been the object of many studies, and the construction of the Watana and Devil Canyon Dams on the Susitna River are under consideration. If these projects are approved, it is likely that Anchorage and Fairbanks will be connected, greatly enhancing the reliability of the two systems.

At this time no pumped-storage facilities are in the State and none are planned by the utilities. While there are many conventional hydropower sites to be developed, there is currently no economic incentive to develop a pumped-storage project.

APA Forecast

Present Conditions

Based on data compiled by the Alaska Power Administration, the overall installed capacity in 1979 was 1,866.8 megawatts, and the overall energy use was 4,836 million kilowatt-hours (552.1 average megawatts). More than one-half of this energy was consumed in the Southcentral subregion, the most heavily populated subregion of the State. Statewide, the total energy demand increased by 1.6 percent in 1979. This was down from the 9.3 percent growth rate registered in 1978. In 1979 the greatest increase in energy demand occurred in the Southeast subregion with an overall growth rate of 4.1 percent followed by the Southcentral subregion with a growth rate of 3.5 percent. All other subregions of the State registered negative overall growth rates. A regional summary of the Alaska capacity and net generation for the years 1977-1979 is presented in Table 4-7.

Future Conditions

The APA has made forecasts of the statewide electrical capacity and energy needs for the years 1990 and 2000 based on high, medium and low growth conditions. The results of the APA forecasts indicate that the total statewide demand for electrical energy including utility, industrial and national defense demands for the medium growth case will have increased from 4,386 million kilowatt-hours (552.1 average megawatts) in 1979 to 9,000 million kilowatt-hours (1,027.4 average megawatts) in 1990 and to 15,000 million kilowatt-hours (1,712.3 average megawatts) in 2000. A summary of the APA demand projections broken down into the various subregions of the State is included in Table 4-8.

Table 4-7
REGIONAL SUMMARY OF ALASKA CAPACITY AND NET GENERATION
1977, 1978, 1979 Preliminary

REGION/Sector	1977 Capacity KW	1977 Net Gen MWH	1978 Capacity KW	1978 Net Gen MWH	77-78 Growth %	1979 Capacity KW	1979 Net Gen MWH	19-79 Growth %
SOUTHEAST								
Utility	143,335	318,515	150,635	332,173	4.3	156,735	355,926	4.1
Industrial	67,125	300,000	67,125	302,957	1.0	67,125	305,265	0.8
Total	210,460	618,515	217,760	635,130	2.7	223,860	661,191	4.1
SOUTHCENTRAL								
Utility	556,383	1,920,710	642,883	2,052,305	6.9	717,533	2,150,386	4.8
Nat. Def.	55,726	153,868	55,726	164,574	7.0	55,726	156,404	-5.0
Industrial	107,890	317,845	113,685	376,028	18.3	113,685	376,028	0
Total	719,999	2,392,424	812,294	2,592,907	8.4	886,944	2,682,818	3.5
YUKON								
Utility	302,250	501,774	293,532	486,532	-3.0	295,132	464,125	-4.6
Nat. Def.	86,625	232,352	86,625	217,967	-6.2	86,625	207,253	-4.9
Industrial	12,000	25,677	16,825	37,853	47.4	16,825	37,853	0
Total	400,875	759,803	396,982	742,432	-2.3	398,582	709,231	-4.5
ARCTIC NORTHWEST								
Utility	24,579	44,905	25,746	47,701	6.2	26,111	48,295	1.3
Nat. Def.	6,940	20,771	6,940	19,470	-6.3	6,190	18,254	-6.2
Industrial	170,325	245,513	198,800	458,072	86.6	198,800	458,072	0
Total	201,844	311,190	231,486	525,243	68.6	231,101	524,621	-0.1
SOUTHWEST								
Utility	24,579	44,905	25,746	47,701	6.2	26,111	48,295	1.3
Nat. Def.	49,200	139,600	56,150	124,800	-10.6	56,150	115,936	-7.1
Total	71,617	181,774	80,702	172,137	-5.3	80,802	163,641	-4.9
ALASKA								
Utility	1,048,964	2,828,079	1,137,348	2,966,129	4.9	1,220,163	3,066,437	3.4
Nat. Def.	198,491	546,591	205,441	526,811	-3.6	204,691	497,847	-5.5
Industrial	402,915	983,144	442,010	1,269,410	29.1	442,010	1,271,718	0.2
Total	1,650,370	4,357,815	1,784,799	4,762,350	9.3	1,866,864	4,836,002	1.6

Table 4-8
APA FORECAST OF ELECTRICAL POWER DEMAND, ALASKA

Area	1979 Capacity (MW)	1979 Energy (GWh)	1980 Capacity (MW)	1980 Energy (GW)	2000 Capacity (MW)	2000 Energy (GWh)
Southcentral	887	2,683	1,442	5,640	2,541	10,560
Yukon (Fairbanks area)	339	709	600	1,364	675	2,072
Southeast	224	661	296	896	349	1,131
Southwest	81	164	108	252	134	358
Remainder of State	227	619	304	848	301	879
Total State	1,867	4,836	2,800	9,000	4,000	15,000

Source: Alaska Power Administration.
Note:
1/ This is compared to the forecast of an energy demand developed by Harza Engineering Company of 7,500 GWh in 2000 (See section 4.2).

Chapter 5
DESCRIPTION OF METHODOLGY FOR EVALUATION OF POTENTIAL HYDROPOWER

5.1 GENERAL

The identification of sites in Alaska at which additional or new hydropower could be feasibly developed was accomplished in four stages. The study began with an inventory of potential hydropower sites, both existing and undeveloped. The criteria applied at each of the successive screening stages required a progressively more rigorous analysis to an ever-decreasing number of sites. The overall objective was to identify sites that would warrant inclusion into a regional hydropower development plan. Table 5-1 provides a summary of the general plan of study. A flow chart of the screening process is shown in Figure 5-1. A discussion of the screening methodology is provided in the following paragraphs.

5.2 INITIAL INVENTORY AND FIRST SCREENING

The objective of stage 1 was to inventory all water resources control sites in Alaska including existing developed sites and previously identified undeveloped sites with the physical potential for hydropower production. To accomplish this objective, an appraisal of the physical potential at both devel oped and undeveloped water resources control sites was developed.

The initial study effort was directed toward identification of undeveloped sites in Alaska with a power potential of one megawatt or larger using data from previous studies and reports. Undeveloped sites with less than 1 MW power potential were eliminated from the study using the formula:

$$\text{Power potential (kW)} = \frac{(Q)(h)(0.076)}{PF}$$

Where: Q = Average annual discharge (cfs)

h = Net power head (ft)
0.076 = Factor based on the constant 11.8 and a plant efficiency of about 85 percent

PF = Plant Factor (assumed 50 percent)

The average annual discharge for each undeveloped site was obtained from actual or simulated measurements as necessary streamgage and observed discharge data recorded by the U.S. Geological Survey (USGS) and data documented by other agencies.

The next effort of stage 1 involved investigation of existing projects in Alaska using data from the Corps of Engineers National Inventory of Dams, and

Table 5-1
GENERAL PLAN OF STUDY

Stage	Objective	Number of Projects and Potential Sites	Basic Evaluation Screening Criteria	Data Required
First	Inventory total physical hydro-power potential	Existing dams and previously identified potential projects	1st screening Installable capacity potential	1. Inventory of dams 2. Previous studies/ inventories of hydro-power potential
Second	Identify physical potential showing possible economic feasibility	Projects from stage 1 with a minimum physical potential	2nd screening Economic-powerhouse cost vs. power benefits	1. Form 1 2. Computer routines-power potential/ powerhouse costs/ power benefits
Third	Identify economically feasible, acceptable projects	Projects from stage 2 with possible economic feasibility	1. 1st screening Economic feasibility total powerplant costs vs. power benefits 2. 2nd Screening Acceptability a. Environmental b. Social c. Marketability	1. 1st screening - Economic feasibility a. Form 2 b. Total plant cost c. Regionalized power benefits d. Computer routines - costs/benefits, hydrology 2. 2nd screening a. Form 2 environmental, social, marketability and acceptability data b. Public Comments
Fourth	Identify projects suitable for study	1. Projects from stage 3 that are economically feasible and acceptable	1. Conventional system - match developable potential with demand. 2. Assess marketability of development.	1. Conventional system - data from stages 1, 2, 3.

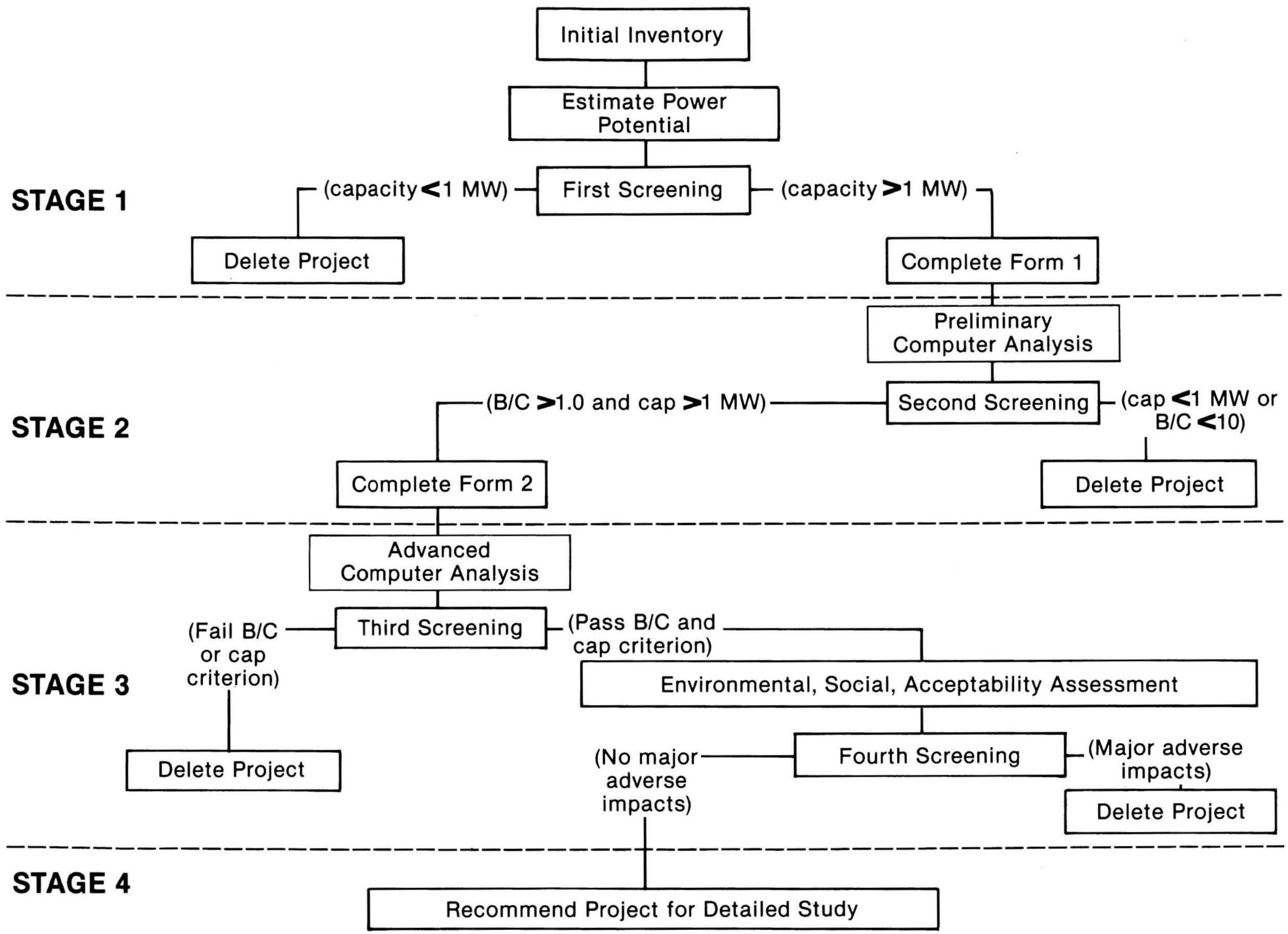


Figure 5-1
FLOW CHART OF SCREENING PROCESS

data on projects licensed by the Federal Energy Regulatory Commission (FERC). Deleted from further study were all existing projects that would not yield a power potential of one megawatt or greater, based on the formula: MW = 36 X storage X head. This formula is based on the assumption that sufficient flow would be available to refill the maximum capacity of each reservoir every 24 hours, and that all of the flow could be used to produce power at a head equal to the height of the water control structure. This assumption assured that any reasonable site would be retained for the next screening which required a more rigorous analysis.

Following completion of the stage 1 evaluation, a Form 1 data sheet was prepared on each developed and undeveloped site which passed the above screening test. Recorded on the data sheets were the project's name, its location by latitude and longitude, the drainage area, a representative streamgage number, average annual flow and the project's installed capacity and corresponding energy values. Also recorded for existing projects were data on the year a project was completed, the type of structure, the active storage behind the impoundment, and the project's specific purpose.

Sites failing to meet the minimum regional standard of one megawatt power potential were not included in the computer data base developed for the study and did not receive further consideration.

5.3 STAGE 2 (SECOND SCREENING)

Stage 2 involved a screening for preliminary economic feasibility of those existing and undeveloped sites that met the one megawatt capacity criteria established for the stage 1 (first screening). The principal task of the stage 2 activity was to refine estimates of capacity and energy for all sites remaining on the active inventory. The criteria required a project to have an economic benefit/cost ratio of 1.0 or greater. However, the economic criteria were preliminary, as only the costs for the powerhouse and switchyard facilities were estimated at this stage. The costs were at October 1978 price levels and were amortized over 100 years at 6-7/8 percent interest to determine average annual costs. These benefit/cost ratios were not interpreted as conventional B/C ratios because only partial costs of power were computed. It was intended only to eliminate sites clearly recognized as lacking economic feasibility. However, because some local conditions merited special considerations, the second screening retained a number of sites in the active file even though preliminary B/C ratio was less than 1.0 to 1.0.

Additional information gathered during the second stage was used to further evaluate the economic feasibility of new hydropower potential. The physical characteristics of the dam considered the structure height and crest length and the valley configuration. Also, the length of any waterway associated with a diversion was considered. Other data compiled at this time included a USGS streamgage number, refined latitude and longitude locations, the reservoir size, and the computed active storage behind the dam impoundment.

Also during stage 2, identification was made of all sites included in the stage 1 initial inventory that were capable of yielding a power potential of

50 kilowatts or greater at a benefit cost ratio of at least 1.0 assuming a discharge exceedance frequency of 25 percent. The purpose of this activity was to provide preliminary public information data on the National Hydroelectric Power Study. In Alaska, 484 sites met the 50 kW - 1.0 B/C ratio criteria. The results of this inventory are published in the report entitled "Preliminary Inventory of Hydropower Resources, Volume 1, July 1979."

5.4 STAGE 3 (THIRD SCREENING)

This screening activity was directed toward identifying those sites which demonstrated firm economic feasibility. Form 2 data sheets were prepared for all projects meeting stage 2 (second screening) criteria. These data included more detailed site locations, physical site and valley characteristics taken from available topographic maps, tailwater rating curves and other data to the extent that it was available.

To assure that project cost etimates would be sufficiently detailed and adequate for comparison, these estimates were based on the average of major construction-cost items derived from historical experience at more than 100 Federally constructed projects nationwide and updated to the July 1978 price level. Power benefits were computed by FERC and are equal to the annual cost of producing a like amount of electricity with a thermal generating plant. The cost of the hydropower project includes all major cost items including where appropriate land, reservoir clearing and preparation, dam, spillway, intake and outlet, waterway, turbines and generators, and switchyard equipment. Because of the difficulty in developing generalized transmission line costs which could be applied nationwide, transmission costs were omitted. (Detailed cost estimating procedures used are described in Volume XIII of the final report on the NHS, Data Base Inventory Support Studies). Annual costs reflect 6-7/8 percent interest, an economic project life of 100 years, costs for major replacements, and charges for annual operation and maintenance. Although cost estimates are adequate for comparing potential hydropower developments with each other on a comparable basis, the costs obtained for the projects are not sufficiently detailed to be relied on as estimates of probable actual construction costs.

5.5 STAGE 3 (FOURTH SCREENING)

This final screening involved the assessment of noneconomic factors to determine overall project acceptability for all projects remaining under study. Data on environmental and social impacts and institutional and marketability constraints to development were compiled and entered on the Form 2 data sheets and computer data base.

Projects were examined with respect to their effects upon existing land use, anadromous fish and wildlife migration and habitat. Also investigated were social impacts including a project's impact on recreation areas, a town site, historic/archaeological sites, and other important cultural resource areas. Current and proposed institutional laws were investigated to determine the extent to which hydropower development has been constrained by such laws as the Alaska Lands Bill. Known data was entered onto the computer data base with an additional comment reflecting the present institutional status. The marketability analysis was prepared by the Alaska Power Administration on those sites which were found to be suitable for further study, after consideration of all other constraints. The purpose of the analysis was to identify those potentially feasible projects for which there would be a projected demand by 2000.

All sites remaining after the third screening were assessed according to the data gathered on environmental, social, and institutional constraints to development. Those sites which passed all three criteria and would be marketable were identified as potentially feasible hydropower projects and are recommended for the detailed study for possible development. Some of the projects are currently in the advanced stages of study or are under construction for power-on-line in the early 1980's. Projects under construction are considered undeveloped since, at this time, they are not yet producing power.

5.6 STAGE 4 REGIONAL POWER PLAN

In this stage a regional power development plan was formulated. Regional power demands were examined and compared to the energy that could be supplied by the projects at those sites remaining under study following the fourth screening. During the development of the regional power plan the sensitivity of changed power values and the removal of environmental constraints were considered. Also, electrical energy supply and demand within the major subregions of the State were analyzed separately in view of the limited present and projected development and the improbability that extensive interties, (with the exception of an Anchorage-Fairbanks intertie), will be developed within the forseeable future.

The Arctic, Northwest and Southwest subregions have scattered isolated electrical power demand centers. Power for these areas is presently generated by fossil fuel plants and is distributed through the local community system. There are no transimission facilities to areas outside each community. Opportunities for interconnection in these isolated areas are highly unlikely. The distances between villages, rugged terrain, and relatively small loads present obstacles which make development of large-scale hydropower projects substantially infeasible in these areas. Special State legislation has provided financing to expedite development of the Kisaralik and Lake Elva projects in the Southwest subregion. The Lake Elva project is of marginal size (1 MW) although it appears to be the major prospect for hydropower in the Dillingham area. There are few options for such remote areas; therefore, diesel-electric powerplants are expected to continue as the main source of electricity past 2000.

The Southcentral subregion has the largest demand for electrical power in Alaska. A number of potential hydropower sites have been investigated. The prime alternative is development of two dams on the Susitna River. The next largest potential hydropower development is on Chakachamna River, however, this project could have land use conflicts since its development would have a minor impact on the Lake Clark National Park. Small individual sites are available that could satisfy a portion of the demand for this market area. Other sites with acceptable capacity and economic capabilities have been precluded by restrictive land use designation, such as national parks, national monuments, national wildlife refugees, and wild and scenic rivers.

The development of an intertie system between Fairbanks, Anchorage, and the Kenai Peninsula has been explored as a means of improving the efficiency in energy use. Current construction includes the interconnection of Glennallen and Valdez. A long range subregional grid interconnection could tie these systems together with the railbelt (Anchorage-Fairbanks) scheme. If economically feasible, this would lead to better regional coordination and optimal use of power generation resources.

Kodiak Island falls within the Southcentral subregion. However, for all practical purposes it remains isolated from any consideration of interties with the mainland. A number of potential hydropower sites on Kodiak were screened out during the advanced planning of the Terror Lake project. This project would generate 20 megawatts of power in the first stage and an additonal 10 megawatts in a second stage of development. Other potential projects on Kodiak Island include Larsen Bay, Port Lions, and Old Harbor. These projects are being addressed in the Small Hydropower Study being done by the Alaska District Corps of Engineers.

The Southeastern subregion is isolated from any of the larger power systems; therefore, separate power systems are required to serve each community. In most cases, the distances between towns, the rugged coastal terrain, and relatively small loads preclude economically feasible intertie developments. A substantial regional transmission system would be needed to utilize the available hydropower energy resources and the required investments for such facilities would be very large. Current planning includes possible interconnection between Petersburg and Wrangell and another system connecting Ketchikan and Metlakatla. This would be a major step toward creation of a Southeast subregional power system. For long range planning, a regional grid interconnection with neighboring Candian systems should be explored. Presently the opportunities for development of many independent hydropower sites to serve individual communities appears to be the most efficient method of meeting the load demands in Southeast Alaska.

5.7 PUBLIC INVOLVEMENT

Public involvement provided effective exchange of data on existing and potential site development. Early public involvement consisted of telephone calls, meetings with individuals, and letters to interested parties. To familiarize the State agencies with the study, a coordination meeting was held in Anchorage on 20 June 1980. The purpose of the meeting was to present the computer techniques used to evaluate the power potential at the respective sites, discuss the procedures for ranking the various projects according to economic and environmental factors, and to discuss the utilization of the completed data.

Public Meeting

A report summarizing the progress of the study was prepared and disseminated in July 1980. This report also announced that a public meeting was to be held on 19 August 1980 to review the findings to date of the National Hydroelectric

Power Study. The meeting was held at Central Junior High School in Anchorage. The meeting was cosponsored by the North Pacific Division and the Alaska District. Colonel Lee R. Nunn, Jr., Alaska District Engineer, chaired the meeting. Colonel Nunn introduced the meeting and made a few general comments about the National Hydropower Study, its objectives and what had been accomplished. Mr. Thomas White, North Pacific Division, study manager, described the regional efforts and how it would fit into the scope of the national study. Mr. Carl Borash, Alaska District, Chief Reports Section, described the study results for the Alaska Region. A question and answer period followed the presentation.

Review of Draft Report

The final stage in the public-involvement process was to make the draft of this report available for review and comment by all those interested. The report draft was completed in December 1980 and was available for review through April 1981. Copies of the report were sent (December) to the Governor and heads of State and Federal Agencies. In addition, a public notice announcing the completion and availability of the report was sent (December) to interested individuals and organizations. The public notice included a summary of the findings of the study and a solicitation that comments be provided. Written comments received were used in revising the report and are included in Appendix B of this report.

Chapter 6
INVENTORY

6.1 GENERAL DISCUSSION OF STAGES 1, 2, and 3

Size of Inventory

During the initial stage of the NHS in Alaska the potential for additional hydropower generation was evaluated at 61 existing water resource project sites and 634 undeveloped sites. By means of the screening process described in Chapter 5, the number of sites demonstrating potential economic feasibility and environmental acceptability (stage 3 - fourth screening) was reduced to 59 including 10 existing projects and 49 undeveloped sites. Because of the number of sites involved and the limited time frame, collection and analysis of site data was based on available and readily developed information. No field investigations were included as part of the study. A summary of the number of projects included in each stage, in each of the six major subregions of the State, is presented in Table 6-1.

Potential Hydropower Capacity and Energy

As indicated above, analyses to date of Alaska's physical hydropower potential and economic and non-economic constraints to project development indicate that just 59 projects are suitable for further study. These project have capacities of at least 1 megawatt, with a few exceptions; are in areas where a demand exists or is projected to exist by 2000; are economically attractive based on their estimated energy costs; and do not have severe environmental or social constraints to development. The following discussion summarizes the findings of the NHS in Alaska during each stage of the study.

Total Physical Hydropower Potential

The State's total physical hydropower potential at projects with a capability of at least 1 megawatt of capacity, with a few exceptions, is represented by those projects which were included in Stage 2 (see table 6-1). The physical characteristics of the sites are such that, from an engineering viewpoint, no insuperable constraints to development exist. The estimated generating capacity available from the State's physically feasible projects is over 42.7 million kilowatts. The average amount of energy available yearly from these projects would amount to over 224.4 billion kilowatt-hours annually, enough electricity to supply the needs of a population of over 40 million, based on 1978 State per capita consumption of 5.6 megawatt-hours. Alternatively, producing the same amount of electricity using oil-fired combustion turbines would require 374 million barrels of oil per year. The potential capacity and energy available from the State's physically feasible projects is shown in Table 6-2; data are shown for each subregion and for existing and undeveloped projects.

Table 6-1
SUMMARY OF HYDROPOWER PROJECT SCREENING RESULTS, ALASKA

	STAGE 1						STAGE 2			STAGE 3					
	Initial Inventory 1/			First Screening 2/			Second Screening 3/			Third Screening 4/			Fourth Screening 5/		
POWER AREA SUBREGION	Existing Projects	Undev. Sites	Total	Existing Projects	Undev. Sites	Total	Existing Projects	Undev. Sites	Total	Existing Projects	Undev. Sites	Total	Existing Projects	Undev. Sites	Total
ARCTIC	0	5	5	0	5	5	0	3	3	0	2	2	0	0	0
NORTHWEST	0	27	27	0	16	16	0	16	16	0	6	6	0	0	0
YUKON	3	56	59	3	51	54	0	51	51	0	21	21	0	1	1
SOUTHWEST	2	38	40	2	28	30	0	28	28	0	7	7	0	1	1
SOUTHCENTRAL	14	196	215	12	138	150	1	132	133	0	41	41	0	16	16
SOUTHEAST	42	312	349	40	189	229	18	173	191	13	70	83	10	28	38
ALASKA TOTAL	61	634	695	57	427	484	19	403	422	13	147	160	10	49	59

Notes:

1/ The total number of existing dams and previously studied, undeveloped sites inventoried (includes mutually exclusive alternative projects).
2/ The number of projects from the intitial inventory might have hydropower development potential and were included in the NHS computer data base. Mutually exclusive alternative projects are included.
3/ The number of existing projects and undeveloped sites which have the physical potential for hydropower development and might be economically feasible. Mutually exclusive alternative projects are included.
4/ The number of projects which would be economically feasible to develop if a market for the power existed and there were no non-economic constraints. Mutually exclusive alternative projects are included.
5/ The number of economically feasible projects which are suitable for further study and possible development. Mutually exclusive alternative projects are not included.

Table 6-2
TOTAL HYDROPOWER POTENTIAL, ALASKA

Subregion	Existing Projects No.	Capacity (MW)	Energy (GWh)	Undeveloped Sites No.	Capacity (MW)	Energy (GWh)	Total No.	Capacity (MW)	Energy (GWh)
ARCTIC	0	0	0	3	222.0	1,073.0	3	222.0	1,073.0
NORTHWEST	0	0	0	16	103.1	4,613.8	16	103.1	4,613.8
SOUTHCENTRAL	1	0.3	0.9	125	11,336.2	58,289.3	126	11,336.5	58,290.2
SOUTHEAST	18	31.6	177.0	170	9,512.3	43,343.9	188	9,543.9	43,520.9
SOUTHWEST	0	0	0	28	3,250.9	14,529.4	28	3,250.9	14,529.4
YUKON	0	0	0	50	18,275.7	102,422.0	50	18,275.7	102,422.0
TOTAL	19	31.9	177.9	392	42,700.2	224,271.4	411	42,732.1	224,449.3

Notes:
1. Excludes existing hydropower projects which do not have additional development potential.
2. Excludes mutually exclusive alternative projects.

Total Economically Feasible Hydropower Potential

The State's economically feasible hydropower potential is represented by those projects which passed stage 3, first screening (third screening shown in Table 6-1). These are projects which would be economical to build when compared with the cost of building thermal power plants to produce an equivalent amount of energy. It is emphasized, however, that hydropower project costs are based on generalized cost estimating procedures adjusted for Alaska construction costs, 6-7/8 percent Federal interest, 1978 price levels, and a 100-year project life. It is further noted that, in this instance, Alaska is unique among states in that its potentially economically feasible hydropower potential greatly exceeds its present and projected demand for electricity. The marketability of potentially feasible projects was considered during the fourth screening, i.e. the second screening of stage 3 as indicated in Table 6-1.

Ignoring the fact that no market exists for much of Alaska's potentially feasible projects, the generating capacity available from the State's economically feasible projects is nearly 38.0 million kilowatts. The average energy available from these projects is over 197.0 billion kilowatt-hours annually. The potential capacity of, and energy available from, the State's economically feasible power projects is shown by subregion, for existing and undeveloped projects in Table 6-3.

Table 6-3
TOTAL ECONOMICALLY FEASIBLE HYDROPOWER POTENTIAL, ALASKA

Subregion	Existing Projects No.	Existing Projects Capacity (MW)	Existing Projects Energy (GWh)	Undeveloped Sites No.	Undeveloped Sites Capacity (MW)	Undeveloped Sites Energy (GWh)	Total No.	Total Capacity (MW)	Total Energy (GWh)
ARCTIC	0	0	0	2	201.0	972.0	2	201.0	972.0
NORTHWEST	0	0	0	6	847.0	3,724.5	6	847.0	3,724.5
SOUTHCENTRAL	0	0	0	38	8,746.0	45,976.4	38	8,746.0	45,976.4
SOUTHEAST	13	25.0	177.0	70	8,828.8	40,138.6	83	8,853.8	40,315.6
SOUTHWEST	0	0	0	7	2,557.7	11,377.7	7	2,557.7	11,377.7
YUKON	0	0	0	20	16,763.6	94,642.0	20	16,763.6	94,642.0
TOTAL	13	5.0	177.0	143	37,944.1	196,831.2	156	37,969.1	197,008.2

Notes:
1/ Excludes mutually exclusive alternative projects.
2/ Potential economic feasibility does not consider marketability.

Projects Suitable for Further Study

To select projects suitable for further study, potentially economically feasible projects were screened to eliminate those with major environmental constraints and those whose output could not be marketed by 2000. Fifty-nine potential projects having a total capacity of over 3.5 million kilowatts and an average energy potential of more than 15.5 billion kilowatt-hours annually passed the environmental and marketability screening criteria and are considered to be suitable for detailed study either by the Corps of Engineers, State or local governments, public or private utilities, or private investors. Projects identified for further study range from small (less than 25 MW) to large capacity. The projects listed by range of capacity are: 20 projects have a capacity of less than 10 MW; 25 projects have a capacity ranging from 10 MW to 50 MW; 7 have a capacity in the 50 MW to 100 MW range; and 6 have a capacity of greater than 100 MW. The capacity and energy potentials from both existing and undeveloped projects are summarized by subregion in Table 6-4.

Plant Factors. Plant factors for the projects passing the stage 3 - fourth screeing of the inventory vary from 0.23 to 0.91. The average plant factor equaled 0.50 with the majority of the projects having plant factors varying from 0.4 to 0.6.

Primary Locations. The greatest number of projects are located in the Southeast subregion which has 38, followed by the Southcentral subregion with 15. The Arctic and Northwest subregions of the State did not have any projects which passed the screening criteria. The Yukon subregion had one project while the Southwest subregion had four projects.

Table 6-4
HYDROPOWER POTENTIAL AT PROJECTS SUITABLE FOR FURTHER STUDY, ALASKA

Subregion	Existing Projects No.	Existing Projects Capacity (MW)	Existing Projects Energy (GWh)	Undeveloped Sites No.	Undeveloped Sites Capacity (MW)	Undeveloped Sites Energy (GWh)	Total No.	Total Capacity (MW)	Total Energy (GWh)
NORTHWEST	0	0	0	0	0	0	0	0	0
NORTHWEST	0	0	0	0	0	0	0	0	0
SOUTHCENTRAL	0	0	0	16	2,738.0	12,161.7	16	2,738.0	12,161.7
SOUTHEAST	10	16.8	161.8	28	520.2	2,276.8	38	537.0	2,438.6
SOUTHWEST	0	0	0	4	51.7	375.7	4	51.7	375.7
YUKON	0	0	0	1	200.0	566.0	1	200.0	566.0
TOTAL	10	16.8	161.8	49	3,509.9	15,380.2	59	3,526.7	15,542.0

Note: Excludes mutually exclusive projects.

Existing Projects. Providing additional hydropower potential from the 10 existing projects would be accomplished through expansion of the existing hydro power plants or providing additional storage. Total potential capacity created by the development was estimated to be 16,800 kilowatts while providing 161.8 million kilowatt-hours annually.

New Sites. There are 49 undeveloped sites having a total capacity of 3.5 million kilowatts and energy potential of nearly 15.4 billion kilowatt-hours.

6.2 Stage 4 Inventory

Projects Retained During Stage 4

The 59 projects that passed the stage 3 fourth screening were retained in stage 4 as projects suitable for further study and possible development.

Physical Characteristics

Selected projects are classified into four groups (see Table 6-5):

a. Reservoir projects.

b. Reservoir with diversion projects.

c. Diversion projects.

d. Run-of-the-river projects.

Existing Projects. Of the existing projects, four are reservoir projects, four are reservoir with diversion projects, one is a diversion project; and one is a run-of-the-river project.

Undeveloped Sites. Twenty-eight of the undeveloped sites would be reservoir with diversion projects; eighteen would be reservoir projects; and three would be run-of-the-river projects.

Economic and Financial Characteristics

The computer estimated average cost of energy for the 59 projects varies from 11.53 mills/kWh to 290.58 mills/kWh. Total annual project costs were derived by summing the annual maintenance costs and the first cost based on 100-years project life and amortized at the Federal discount rate of 6-7/8 percent.

General Environmental and Social Conditions

Expansion of the existing hydropower projects would have no significant environmental impact in most cases. Generally, any adverse modification to the environment would have already occurred.

All of the new development sites were assessed in relation to their impact on fish and wildlife, cultural resources, scenic beauty and impacts to designated national parks or monuments. Those projects which would have significant adverse impacts on these resources were dropped from further study. The projects identified for further study either would have minimal adverse impacts, or the magnitude of the impacts have not been conclusively determined.

Table 6-5
PROJECT TYPE AND STATUS IDENTIFIER

	Type of Operation					
Status of Waterway Structure	Run of River	Diversion	Reservoir	Reservoir with Diversion	Irrigation Canal	Pumped Storage
Existing	A	B	C	D	E	F
Existing with Power	G	H	I	J	K	L
Existing with Retired Power Plant	M	N	O	P	Q	R
Breached	S	T	U	V	W	X
Breached with Retired Power Plant	Y	Z	0	1	2	3
Undeveloped	4	5	6	7	8	9

Chapter 7
EVATUATION

7.1 REGIONAL PLAN DEVELOPMENT PROGRAM

The impact of hydropower development was addressed through evaluation of preliminary environmental constraints and screening criteria. Much of the potential land and water resource development in Alaska is subject to current political issues. Until recently, millions of acres of Alaska were withdrawn from potential development by former President Carter under the provisions of the Antiquites Act. The Alaska Lands Bill passed by Congress and signed into law in December 1980 negated the land withdrawals under the Antiquites Act but then designated a majority of these same lands, plus additional lands, as either national parks, wild and scenic rivers, wildlife refuges, or wilderness areas. Until implementation regulations are promulgated, it is unknown whether potential hydropower projects will be precluded from development by certain land classifications. It is hoped that this study will provide useful information for continued assessment of hydropower development as a viable alternative for meeting Alaska's future energy needs.

A total of 49 undeveloped sites and 10 existing projects have emerged from the three-stage screening for possible adoption in a development plan for Alaska. These 59 projects are listed on Table 7-1, and their locations are shown in Figure 7-1. They are listed by map number and should not be construed as being in order of preferred development. More complete physical, environmental, and social impact data on these and other projects studied are presented in Appendix A.

The projects passing the final screeing have been evaluated as to their potential impacts on several environmental and social concerns. These potential impacts have been coded and are listed in the Appendix. A ranking system based upon economic and environmental considerations was not developed. It was determined that such a ranking system would be inappropriate for Alaska. In Alaska, the decision to develop a hydropower project must be based on a need as well as a viable means of satisfying that need for a given locality. Interties between geographical regions and communities are impractical in many areas, especially Southeast Alaska.

7.2 TRANSMISSION INTERTIES

Alaska's population is primarily urban, concentrated in a few principal cities and many smaller towns and villages. Fairly extensive interconnected systems serve the population centers in the Anchorage-Cook Inlet and Fairbanks-Tanana Valley areas. The rest of the State's power systems are isolated, with electrical service usually limited to the immediate urban and suburban areas. Some small communities scattered throughout the State have interties between local utilities, industries, and military bases. Over 60 percent of the State's population is served by the interconnected transmission system in the Anchorage-Cook Inlet area. Five utilities, several industries, and two national defense installations are tied to this system. In the Fairbanks area, two utilities and three military bases are intertied.

Table 7-1
POTENTIAL HYDROPOWER SITES IDENTIFIED FOR DETAILED STUDY, ALASKA

Map Index Number	Subregion Project Name	Site Ident Number	Stream	Latitude	Longitude	Owner	Additional Capacity Potential (kW)	Additional Energy Potential (MWh)	Average Cost of Energy (mills/KWh)
	Yukon								
1.	Browne	AK6NPA0427	Nenana River	64 11.0	149 15.0	undeveloped	200,000	566,000	48.99
	Southwest								
2.	Kisaralik	AK6NPA0012	Kisaralik River	60 26.4	160 5.5	undeveloped	30,000	131,000	56.72
3.	Tazimina	AK6NPA0032	Tazimina	59 58.0	154 33.0	undeveloped	18,000	224,000	17.00
4.	Grant Lake	AK7NPA0018	Wood River	59 45.1	158 32.0	undeveloped	2,700	12,700	145.87
5.	Lake Elva	AK7NPA0155	Elva Creek	59 37.9	157 0.0	undeveloped	1,000	8,000	290.58
	Southcentral								
6.	Chulitna	AK6NPA0181	Chulitna River	63 4.9	149 45.0	undeveloped	34,000	166,000	45.07
7.	Devil Canyon	AK6NPA0188	Susitna River	62 48.9	149 18.9	undeveloped	776,000	3,410,000	11.53
8.	Watana	AK6NPA0222	Susitna River	62 48.9	148 30.9	undeveloped	792,000	3,480,000	17.97
9.	Chakachamna	AK7NPA0106	Chakachamna	61 13.0	152 22.0	undeveloped	366,000	1,600,000	12.30 1/

1/ The project cost estimate for Chakachmna assumed construction of a open-channel waterway; but a tunnel would be required thus substantially adding to its costs.

Table 7-1(cont)

Map Index Number	Subregion Project Name	Site Ident Number	Stream	Latitude	Longitude	Owner	Additional Capacity Potential (kW)	Additional Energy Potential (MWh)	Average Cost of Energy (mills/KWh)
10.	Talkeetna	AK6NPA0216	Talkeetna River	62 28.0	149 22.0	undeveloped	90,000	406,400	23.34
11.	Keetna	AK6NPA0197	Talkeetna River	62 26.5	149 41.6	undeveloped	74,000	324,000	30.38
12.	Skwentna	AK6NPA0211	Skwentna River	61 51.9	152 7.0	undeveloped	98,000	490,000	30.02
13.	Yentna	AK6NPA0224	Yentna River	61 36.9	150 32.0	undeveloped	219,000	960,000	38.47
14.	Beluga Upper	AK6NPA0175	Beluga River	61 15.9	151 15.0	undeveloped	48,000	210,000	53.06
15.	Coffee	AK6NPA0108	Beluga River	61 12.0	151 10.0	undeveloped	37,000	160,000	50.41
16.	Solomon Gulch	AK7NPA0384	Solomon Gulch	61 30.9	146 15.9	under const.	12,000	65,000	25.57
17.	Allison Creek	AK7NPA0041	Allison Creek	61 7.1	146 10.2	undeveloped	8,000	37,250	32.16
18.	Snow	AK7NPA0283	Snow River	60 17.9	149 18.0	undeveloped	63,000	278,000	31.24
19.	Bradley Lake	AK7NPA0103	Bradley Creek	59 45.0	150 51.0	undeveloped	94,000	410,000	18.40
20.	Terror Lake	AK7NPA0166	Terror River	57 40.0	153 6.0	undeveloped	20,000	139,000	19.94
21.	Power Creek	AK7NPA0039	Power Creek	60 36.0	145 34.0	undeveloped	7,000	26,000	103.34
	Southeast								
22.	Pelican	AKINPA0346	Pelican Creek	57 34.7	136 7.8	Pelican Utility Co.	1,000	1,700	75.57

Table 7-1(cont)

Map Index Number	Subregion Project Name	Site Ident Number	Stream	Latitude	Longitude	Owner	Additional Capacity Potential (kW)	Additional Energy Potential (MWh)	Average Cost of Energy (mills/KWh)
23.	Kasnyku Lake	AK7NPA0335	Kasnyku Falls	57 11.0	134 49.9	undeveloped	7,000	30,000	41.63
24.	Takatz Creek	AK7NPA0311	Takatz Creek	57 6.9	134 51.0	undeveloped	20,000	97,000	34.48
25.	Carbon Lake	AK7NPA0321	Unnamed	57 1.9	134 28.1	undeveloped	10,000	49,000	58.16
26.	Milk Lake	AK7NPA0294	Milk Creek	56 58.0	134 47.0	undeveloped	7,000	33,000	39.10
27.	Diana Lake	AK7NPA0325	Unnamed	56 53.0	135 3.0	undeveloped	8,000	35,000	35.65
28.	Green Lake	AK7NPA0332	Vodopad River	56 95.3	135 11.6	under const.	16,000	64,000	48.47
29.	Maksoutof	AK7NPA0291	Maksoutof	56 30.0	134 57.9	undeveloped	24,000	117,000	23.47
30.	Borodino Lake	AK7NPA0319	B.P. Walter	56 22.3	134 42.9	undeveloped	5,000	24,300	44.51
31.	Goat Lake	AK7NPA0357	Pitch Fork	59 31.3	135 11.0	undeveloped	10,000	46,000	33.80
32.	Dewey Lake	AKINPA0359	Dewey Creek	59 26.4	135 18.9	Alaska Power & Tele Co	1,000	1,300	83.40
33.	Dayebas Creek	AK4NPA0078	Dayebas Creek	59 17.2	135 2.0	undeveloped	5,000	18,200	65.95
34.	Gold Creek 1/	AKHNPA0099	Gold Creek	58 17.9	134 23.9	Alaska Elec Light & Power Co.	2,000	9,000	34.90

1/ Although shown here and on the map (figure 7-1), reassessment of Gold Creek indicates that additional development, although potentially feasible, is unlikely.

Table 7-1(Cont)

Map Index Number	Subregion Project Name	Site Ident Number	Stream	Latitude	Longitude	Owner	Additional Capacity Potential (kW)	Additional Energy Potential (MWh)	Average Cost of Energy (mills/KWh)
35.	Treadwell Ditch 1/	AKMNPA0086	Treadwell	58 15.5	134 22.3	Alaska Treadwell	2,500	10,000	25.70
36.	Annex	AKINPA0098	Annex Creek	58 19.5	134 7.6	A.J. Ind.	1,800	3,000	15.24
37.	Lake Dorothy	AK5NPA0096	Dorothy Creek	58 14.0	134 3.0	undeveloped	34,000	150,000	15.24
38.	Speel Division	AK6NPA0082	Speel River	58 6.9	133 42.9	undeveloped	63,000	275,000	32.84
39.	Snettisham 2/	AKJNPA0102	Long Lake	58 5.9	133 48.0	Alaska Power Administration	0	57,100	23.50
40.	Crater Lake 2/	AK7NPA0356	Crater Creek	58 8.0	133 45.7	undeveloped	27,000	106,000	30.47
41.	Tease	AK7NPA0084	Tease Creek	58 5.9	133 40.2	undeveloped	16,000	70,000	29.42
42.	Upper Sweetheart	AK7NPA0143	Sweetheart	57 59.7	133 30.6	undeveloped	7,000	31,000	42.94
43.	Sweetheart	AK7NPA0083	Sweetheart	57 56.6	133 38.1	undeveloped	29,000	127,000	38.19
44.	Scenery Creek	AK7NPA0401	Scenery Creek	57 4.9	132 41.9	undeveloped	15,000	67,000	34.04
45.	Falls Lake	AK7NPA0417	Cascade Creek	57 1.1	132 45.1	undeveloped	44,000	190,000	18.20
46.	Thomas Bay	AK7NPA0310	Cascade Creek	57 3.3	132 45.2	undeveloped	50,000	217,000	18.47
47.	Ruth Lake	AK7NPA0400	Delt Creek	56 59.0	132 45.0	undeveloped	13,000	63,000	45.61

1/ Reconstruction of abandoned project considered unlikely today by Alaska Power Administration.
2/ Capacity and energy potentials and project costs are based on a Juneau area power market analysis by Alaska Power Administration and on site-specific studies of hydrology and construction costs by the Corps of Engineers.

Table 7-1(concluded)

Map Index Number	Subregion Project Name	Site Ident Number	Stream	Latitude	Longitude	Owner	Additional Capacity Potential (kW)	Additional Energy Potential (MWh)	Average Cost of Energy (mills/KWh)
48.	Anita	AK6NPA0414	Zimovia Straight	56 15.5	132 26.5	undeveloped	3,200	14,000	54.60
49.	Harding River	AK7NPA0301	Harding River	56 16.1	131 38.9	undeveloped	18,000	85,000	60.44
50.	Tyee Creek	AK7NPA0408	Tyee Creek	56 12.0	131 33.0	undeveloped	30,000	133,000	27.66
51.	Swan Lake	AK7NPA0132	Falls Creek	55 35.9	131 31.1	undeveloped	22,000	85,000	58.33
52.	Mahoney Lake	AK7NPA0123	Mahoney Lake	55 25.0	131 31.1	undeveloped	14,400	56,000	30.42
53.	Upper Silvis	AKDNPA0139	Beaver Falls	55 22.8	131 30.9	City of Ketchikan	2,000	49,100	21.71
54.	Lake Connell	AKDNPA0141	Ward Creek	55 26.0	131 40.2	City of Ketchikan	2,000	10,400	56.45
55.	Ketchikan	AKINPA0138	Ketchikan Creek	55 21.5	131 37.0	City of Ketchikan	2,000	15,000	15.11
56.	Chester Lake	AKPNPA0097	Nichols Off	55 7.1	131 31.6	City of Metlakatla	2,500	5,200	48.785
57.	Black Bear	AK7NPA0104	Black Bear	56 32.9	132 0.5	undeveloped	5,000	22,000	44.36
58.	Lake Mary	AK7NPA0395	Old Franks Creek	55 26.0	132 29.0	undeveloped	9,600	42,300	49.80
59.	Mellen Lake	AK7NPA0255	Reynolds Creek	55 12.0	132 36.0	undeveloped	8,000	30,000	41.68

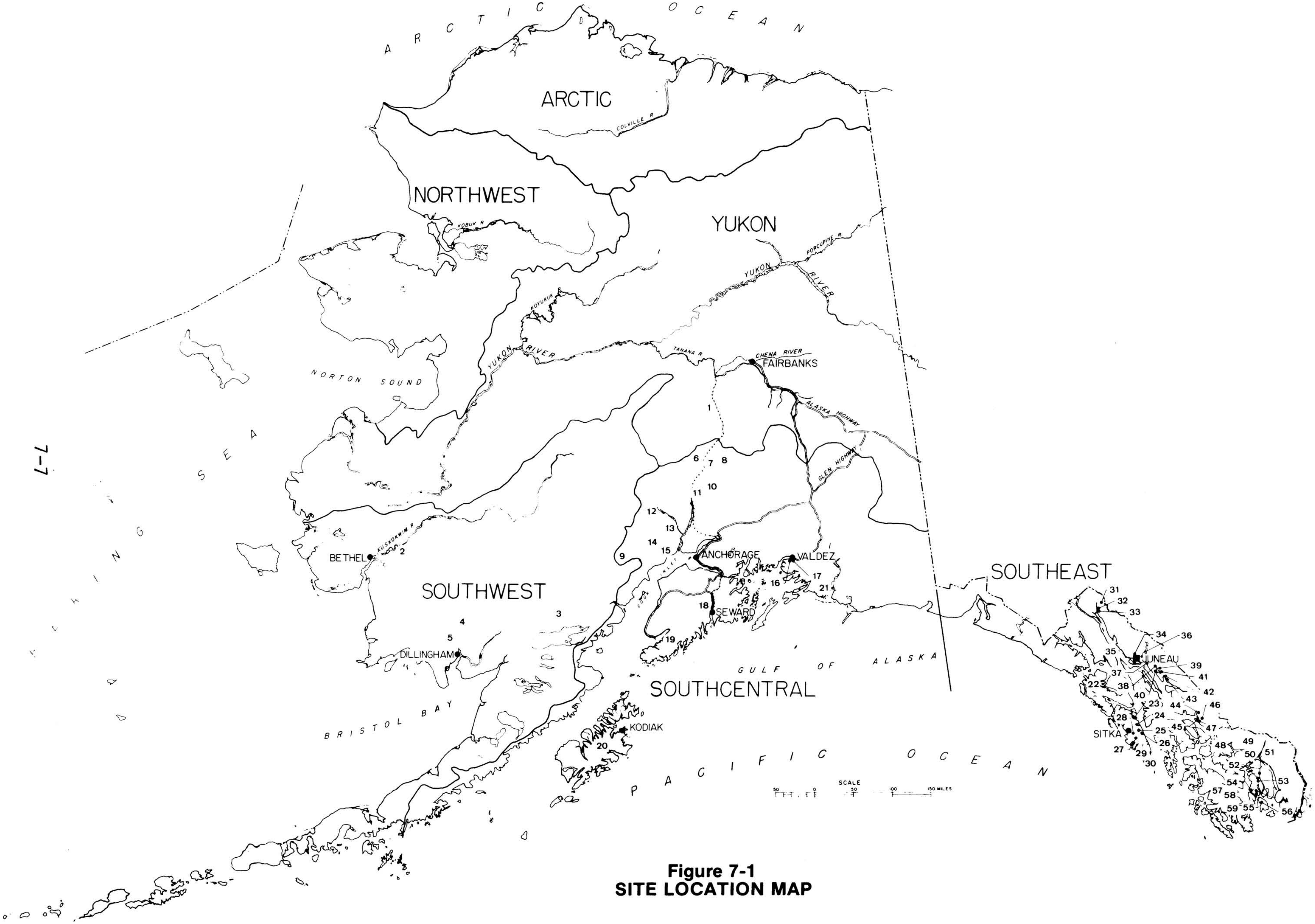


Figure 7-1
SITE LOCATION MAP

7.3 COMPARISON OF ELECTRICAL POWER DEMAND WITH HYDROPOWER POTENTIAL

The projections of capacity and energy demand shown following for each subregion include utility, self-supplied industry, and national defense needs.

Table 7-2
SUMMARY OF REGIONAL ELECTRICAL CAPACITY AND ENERGY DEMAND, ALASKA

	1979		1990		2000	
Subregion	Capacity (MW)	Energy (GWh)	Capacity (MW)	Energy (GWh)	Capacity (MW)	Energy (GWh)
Southcentral	887	2,683	1,442	5,640	2,541	10,560
Yukon	399	709	600	1,364	675	2,072
Southeast	224	661	296	896	349	1,131
Southwest	81	164	108	252	134	358
Remainder of State	277	619	304	848	301	879
Total	1,867	4,836	2,800	9,000	4,000	15,000

The year 2000 energy requirement of 15.0 billion kilowatt-hours is roughly a three-fold increase over estimated 1980 requirements and would represent an average annual growth of 6 percent for the 20-year period.

It is likely that actual requirements may be substantially higher or lower depending on pace of development of the Alaska economy and effectiveness of various energy conservation programs.

Harza Engineering Company, in connection with the NHS, prepared three projections of future electric energy needs. Year 2000 estimates of energy use excluding national defense and industrial use were as follows: Projection 1--14.5 billion kilowatt-hours; Projection 2--5.8 billion kilowatt-hours; and Projection 3--7.5 billion kilowatt-hours; Projection 1 of 14.5 billion kilowatt-hours is very close to APA's estimate of 15 billion kilowatt-hours. Inasmuch as the Harza projections (1) did not consider national defense and industrial needs and (2) used the 1972 OBERS population projections, which are generally recognized as being inappropriate for Alaska conditions, it would be reasonable to accept the APA projection as more realistic.

Comparing the hydropower potential with the projected demand of each region (Table 7-3) reveals that, with electrical transmission interties, most of the power needs of the Southeast, Southcentral, and the Yukon subregions of Alaska could be met by hydropower. In addition, approximately 39 percent of the power requirements of the Southwest could be met by hydropower. The power requirements of the Arctic and Northwest subregions would have to be met by other means.

Table 7-3
REGIONAL ELECTRICAL CAPACITY AND ENERGY DEMAND VERSUS HYDROPOWER POTENTIAL

Region	Estimated Demand		Hydropower Potential		Marketable Hydropower Potential 1/	
	Capacity (MW)	Energy (GWh)	Capacity (MW)	Energy (GWh)	Capacity (MW)	Energy (GWh)
Southcentral	2,541	10,560	2,738	12,162	2,587	11,184
Southeast	349	1,131	537	2,439	152	668
Southwest	134	358	52	376	84	368
Yukon	675	2,072	200	566	200	566
Remainder of State	301	879	0	0	0	0
	4,000	15,000	3,527	15,543	3,023	12,786

1/ Marketable Projects by Year 2000. Source: Alaska Power Administration

Appendix A
SUMMARY OF LISTING OF POTENTIAL PROJECTS

Introduction

A primary objective of the NHS was to inventory and evaluate potential hydropower projects. Projects inventoried included existing dams and other water projects and previously studied undeveloped sites. Project data were compiled from existing information sources supplemented by data from USGS topographic maps, where necessary. No site visits or other field investigations were made. Although to the extent possible, all existing and undeveloped projects were inventoried, only those projects with existing power generating facilities or projects with a reasonable potential for development for hydropower were retained in the NHS inventory. This inventory is permanently maintained in a computer data base which includes descriptive information and the results of a computer analysis of power potential and development costs for each project. In all, the active inventory for Alaska includes 430 projects.

Tabulated Data

The purpose of this appendix is to provide a summary listing of selected data on the 430 existing and potential hydropower projects which were included in the NHS inventory (computer data base) for Alaska. In the following table, projects are listed in alphabetical order by census division. A description of the data included in the table precedes the tabulated information. However, a few items warrant clarification:

(1) Up to four lines of information are presented for each project.

(2) Projects are separated by a space.

(3) As noted in the description of tabulated data. The third character of the project indentification number describes the type and status of the project. A description of each of the possible project status/types is shown in the following matrix:

STATUS OF WATERWAY STRUCTURE	TYPE OF OPERATION					
	RUN OF RIVER	DIVERSION	RESERVOIR	RES. WITH DIVERSION	IRRIGATION CANAL	STORAGE
EXISTING	A	B	C	D	E	F
EXISTING WITH POWER	G	H	I	J	K	L
EXISTING WITH RETIRED POWER PLANT	M	N	O	P	Q	R
BREACHED	S	T	U	V	W	X
BREACHED WITH RETIRED POWER PLANT	Y	Z	0	1	2	3
UNDEVELOPED	4	5	6	7	8	9

(4) Project costs shown were derived from computer application of generalized cost estimating procedures and should not be construed to be representative of actual costs.

Summary Listing of Existing and Potential Projects, Alaska
Description of Tabulated Data

COLUMN NO.	LINE NO.	FORM 2 ITEM NO.	COLUMN HEADING	DESCRIPTION
1	1	1	SITE ID NUMBER	UNIQUE 10-CHARACTER IDENTIFIER FOR EACH SITE. EXAMPLE: HICPOH0003 CHARACTERS: VALUE: 1-2 HI = STATE CODE (POSTAL ABBREVIATION) 3 C = TYPE AND STATUS CODE (REFER TO FORM 2 ITEM DESCRIPTION DOCUMENTATION FOR ITEM 84). CODES A THRU R INDICATE EXISTING PROJECTS, S THRU 3 INDICATE BREACHED PROJECTS AND 4 THRU 9 INDICATE UNDEVELOPED PROJECTS FOR VARIOUS TYPES OF OPERATION. 4-6 POH = U.S. ARMY CORPS OF ENGINEERS DISTRICT CODE (REFER TO FORM 2 ITEM DESCRIPTION DOCUMENTATION FOR ITEM 33) 7-10 0003 = UNIQUE SEQUENTIAL NUMBER WITHIN EACH DISTRICT
2	1	2	PROJECT NAME	IDENTIFICATION NAME OF EXISTING DAM OR POTENTIAL WATER MANAGEMENT PROJECT (NOTE: ONLY THE FIRST 29 CHARACTERS OF A POSSIBLE 40 CHARACTERS ARE PRINTED).
3	1	40	PRIMARY COUNTY	PRIMARY COUNTY NAME IN WHICH THE PROJECT IS LOCATED.
4	1	310	INCREMENTAL CAPACITY	AMOUNT OF INCREMENTAL POTENTIAL CAPACITY (IN KW) THAT IS ESTIMATED FOR THE PROJECT.
5	1	311	INCREMENTAL ENERGY	AMOUNT OF INCREMENTAL POTENTIAL AVERAGE ANNUAL ENERGY (IN MWH) THAT IS ESTIMATED FOR THE PROJECT.
6	1	(318/311)	INCREMENTAL COST	COST (IN $/MWH) OF PRODUCING THE INCREMENTAL POTENTIAL ENERGY FOR THE PROJECT.

Description of Tabulated Data(continued)

EXPLANATION OF ENVIRONMENTAL AND SOCIAL IMPACT CODES: (COLUMNS 7 - 8)

ALPHABETICAL CODES Y, N, AND U ARE DEFINED AS FOLLOWS:

Y = YES
N = NO
U = UNKNOWN

NUMERICAL CODES 1 THROUGH 5 ARE DEFINED AS FOLLOWS:

1 = MAJOR ADVERSE
2 = MINOR ADVERSE
3 = INSIGNIFICANT
4 = MINOR FAVORABLE
5 = MAJOR FAVORABLE

COLUMN NO.	LINE NO.	FORM 2 ITEM NO.	COLUMN HEADING	DESCRIPTION
7	1	668	ENVRNMNTL IMPACT CODE	SEVEN CHARACTER ENVIRONMENTAL IMPACT CODE IS DEFINED AS FOLLOWS:

CHARACTER POSITION	DESCRIPTION
1ST	NATIONAL/STATE PARKS AND WILDERNESS
2ND	WILD AND SCENIC RIVER
3RD	RESIDENT FISH
4TH	ANADROMOUS FISH
5TH	WILDLIFE HABITAT
6TH	ENDANGERED SPECIES
7TH	WETLANDS

COLUMN NO.	LINE NO.	FORM 2 ITEM NO.	COLUMN HEADING	DESCRIPTION
8	1	669	SOCIAL IMPACT CODE	NINE CHARACTER SOCIAL IMPACT CODE IS DEFINED AS FOLLOWS:

CHARACTER POSITION	DESCRIPTION
1ST	CULTURAL AND HISTORICAL RESOURCES
2ND	COMMUNITIES RELOCATED
3RD	TRANSPORTATION RELOCATED
4TH	FARMLAND
5TH	LOCAL GROUP COMMENT
6TH	ENVIRONMENTAL GROUP COMMENT
7TH	OTHER GROUP COMMENT
8TH	UTILITY INTEREST
9TH	STATE COMMENT

Description of Tabulated Data (continued)

COLUMN NO.	LINE NO.	FORM 2 ITEM NO.	COLUMN HEADING	DESCRIPTION
1	1	1	SITE ID NUMBER	UNIQUE 10-CHARACTER IDENTIFIER FOR EACH SITE. EXAMPLE: HICPOH0003 CHARACTERS: VALUE: 1-2 HI = STATE CODE (POSTAL ABBREVIATION) 3 C = TYPE AND STATUS CODE (REFER TO FORM 2 ITEM DESCRIPTION DOCUMENTATION FOR ITEM 84). CODES A THRU R INDICATE EXISTING PROJECTS. S THRU 3 INDICATE BREACHED PROJECTS AND 4 THRU 9 INDICATE UNDEVELOPED PROJECTS FOR VARIOUS TYPES OF OPERATION. 4-6 POH = U.S. ARMY CORPS OF ENGINEERS DISTRICT CODE (REFER TO FORM 2 ITEM DESCRIPTION DOCUMENTATION FOR ITEM 33) 7-10 0003 = UNIQUE SEQUENTIAL NUMBER WITHIN EACH DISTRICT
1	2A	65	DEP CODE	IDENTIFICATION OF UNDEVELOPED PROJECTS AS AN ALTERNATIVE TO SOME OTHER PROJECT OR AS A PART OF SOME SYSTEM. THIS ITEM ALSO INDICATES WHICH ONE OF THE POSSIBLE ALTERNATIVE PROJECTS SHOULD BE INCLUDED IN ESTIMATES OF TOTAL NATIONAL POTENTIAL. THE DEPENDENT/INDEPENDENT CODE IS DEFINED AS FOLLOWS: I = INDEPENDENT SITE. E = DEPENDENT, ALTERNATIVE SITE, EXCLUDED FROM SUMMARIES. S = DEPENDENT, PART OF A SYSTEM. THIS SITE SHOULD BE INCLUDED IN SUMMARY TABLES. D = DEPENDENT, ALTERNATIVE SITES WHICH ARE CHOSEN BY DISTRICT FOR INCLUSION IN SUMMARY TABLES.

Description of Tabulated Data(continued)

COLUMN NO.	LINE NO.	FORM 2 ITEM NO.	COLUMN HEADING	DESCRIPTION
1	2B	3	ACTV INV	ACTIVE IN INVENTORY CODE FOR IDENTIFYING SITES BASED ON CAPACITY AND B/C RATIOS. (SEE FORM 2 ITEM DESCRIPTION DOCUMENTATION FOR DETAILED EXPLANATION OF CODES). SOME OF THE MORE COMMON ACTIVE IN INVENTORY CODES ARE AS FOLLOWS: 1 = SITES CONSIDERED INACTIVE FOR STUDY THAT HAVE A TOTAL POTENTIAL CAPACITY BETWEEN 50 KW AND 1000 KW AND A B/C RATIO GREATER THAN 1.0. 2 = SITES CONSIDERED ACTIVE FOR STUDY THAT HAVE A TOTAL POTENTIAL CAPACITY GREATER THAN OR EQUAL TO 1000 KW AND B/C RATIO GREATER THAN OR EQUAL TO 1.0 (NOTE: OTHER SITES CHOSEN BY THE DISTRICTS CAN ALSO HAVE A CODE = 2 TO INDICATE ACTIVE STATUS). 4 = SITES CONSIDERED INACTIVE FOR STUDY WHERE THE TOTAL POTENTIAL CAPACITY IS LESS THAN 50 KW OR THE B/C RATIO IS LESS THAN 1.0. 5 = SITE CONSIDERED INACTIVE FOR STUDY BECAUSE ADVANCED ANALYSIS SHOWED DEVELOPMENT OF THE SITE TO BE ECONOMICALLY OR ENGINEERINGLY INFEASIBLE. 6 = SITES CONSIDERED INACTIVE FOR STUDY BECAUSE THEY FAILED THE SCREENING ON ADVERSE ENVIRONMENTAL, SOCIAL, AND/OR INSTITUTIONAL IMPACTS.
1	3	53	POWER AREA	ELECTRIC RELIABILITY COUNCIL SUB-REGION (GEOGRAPHIC AREA FOR ALASKA).
2	1	2	PROJECT NAME	IDENTIFICATION NAME OF EXISTING DAM OR POTENTIAL WATER MANAGEMENT PROJECT (NOTE: ONLY THE FIRST 29 CHARACTERS OF A POSSIBLE 40 CHARACTERS ARE PRINTED).
2	2A	40	PRIMARY COUNTY	PRIMARY COUNTY NAME IN WHICH THE PROJECT IS LOCATED.
2	2B	31	NAME OF STREAM	NAME OF STREAM WHERE THE PROJECT IS LOCATED.
2	3	60	OWNER	IDENTIFICATION OF PROJECT OWNER. NOTE: DAEN XXX REPRESENTS U.S. ARMY CORPS OF ENGINEERS WHERE XXX INDICATES THE DISTRICT CODE (REFER TO FORM 2 ITEM DESCRIPTION DOCUMENTATION FOR A LIST OF DISTRICT CODES AND FEDERAL AGENCIES).
2	4	160	MAP REFERENCE	IDENTIFICATION OF USGS MAP SHOWING LOCATION OF SITES AND OTHER MAPS AS NEEDED FOR IDENTIFICATION.
3	1	36	LATITUDE	IDENTIFICATION OF PROJECT LOCATION BY LATITUDE (DEGREES, MINUTES AND TENTHS OF MINUTES).
3	2	37	LONGITUDE	IDENTIFICATION OF PROJECT LOCATION BY LONGITUDE (DEGREES, MINUTES AND TENTHS OF MINUTES).
3	3	126	DR. AREA	DRAINAGE AREA (IN SQUARE MILES) OF THE PROJECT.

Description of Tabulated Data(continued)

COLUMN NO.	LINE NO.	FORM 2 ITEM NO.	COLUMN HEADING	DESCRIPTION
4	1	62	PROJ. PURP.	IDENTIFICATION OF AUTHORIZED PROJECT PURPOSES AS FOLLOWS: I = IRRIGATION R = RECREATION H = HYDROELECTRIC D = DEBRIS CONTROL C = FLOOD CONTROL P = FARM POND N = NAVIGATION O = OTHER S = WATER SUPPLY
4	2	63	STATUS	INDICATION OF PROJECT STATUS AS FOLLOWS: IS = IDENTIFIED SITE PA = PROJECT AUTHORIZED SP = STUDY PROPOSED DM = GDM IN PROGRESS SA = AUTHORIZED FOR STUDY UC = UNDER CONSTRUCTION FP = FEASIBILITY STUDY IN PROGRESS OP = PROJECT IN OPERATION SI = STUDY INACTIVE
4	3	128	AVE. Q	AVERAGE ANNUAL INFLOW (IN CFS). NOTE: NEGATIVE VALUES INDICATE MACHINE DETERMINED VALUES BASED ON A DRAINAGE AREA RATIO OF THE PROJECT TO THE REPRESENTATIVE GAGE.
5	1	81	DAM HT	PHYSICAL HEIGHT (IN FEET) OF DAM ABOVE THE STREAMBED.
5	2	88	TOT. STOR	CUMULATIVE STORAGE (IN ACRE-FEET) AT TOP OF FLOOD CONTROL POOL. IF ITEM 88 WAS NOT SUPPLIED, THEN THE STORAGE VALUE WAS TRANSFERRED FROM ITEM 104, MAXIMUM STORAGE (IN ACRE-FEET).
5	3	11	PWR. HD.	WEIGHTED NET POWER HEAD IF DETERMINED BY PROGRAM: (ITEM 11) IF COMPUTED BY FLOW-DURATION PROCEDURE OR TRANSFERRED FROM NORMAL NET POWER HEAD (ITEM 105).
6	1	300	EXIST. CAP.	AMOUNT OF EXISTING CAPACITY (IN KW) FOR THE PROJECT.
6	2	310	INC. CAP.	AMOUNT OF INCREMENTAL CAPACITY (IN KW) THAT IS ESTIMATED FOR THE PROJECT.
6	3	290	TOT. CAP.	AMOUNT OF TOTAL CAPACITY (IN KW) THAT IS ESTIMATED FOR THE PROJECT (EXISTING PLUS INCREMENTAL).
7	1	301	EXIST. ENRG.	AMOUNT OF EXISTING ENERGY (IN MWH) FOR THE PROJECT.
7	2	311	INC. ENERGY	AMOUNT OF INCREMENTAL AVERAGE ANNUAL ENERGY (IN MWH) THAT IS ESTIMATED FOR THE PROJECT.
7	3	291	TOT. ENERGY	AMOUNT OF TOTAL ENERGY (IN MWH) THAT IS ESTIMATED FOR THE PROJECT (EXISTING PLUS INCREMENTAL).
8	1	318	ANUL. COST	TOTAL ANNUAL COST (IN 1000 $) OF PRODUCING THE INCREMENTAL POTENTIAL AVERAGE ANNUAL ENERGY THAT IS ESTIMATED FOR THE PROJECT.
8	2	318/311	ENERGY COST	COST (IN $/MWH) OF PRODUCING THE INCREMENTAL POTENTIAL ENERGY THAT IS ESTIMATED FOR THE PROJECT.

Description of Tabulated Data(continued)

EXPLANATION OF ENVIRONMENTAL AND SOCIAL IMPACT CODES: (COLUMNS 7 - 8)

ALPHABETICAL CODES Y, N, AND U ARE DEFINED AS FOLLOWS:

Y = YES
N = NO
U = UNKNOWN

NUMERICAL CODES 1 THROUGH 5 ARE DEFINED AS FOLLOWS:

1 = MAJOR ADVERSE
2 = MINOR ADVERSE
3 = INSIGNIFICANT
4 = MINOR FAVORABLE
5 = MAJOR FAVORABLE

COLUMN NO.	LINE NO.	FORM 2 ITEM NO.	COLUMN HEADING	DESCRIPTION
7	1	668	ENVRNMNTL IMPACT CODE	SEVEN CHARACTER ENVIRONMENTAL IMPACT CODE IS DEFINED AS FOLLOWS:

CHARACTER POSITION	DESCRIPTION
1ST	NATIONAL/STATE PARKS AND WILDERNESS
2ND	WILD AND SCENIC RIVER
3RD	RESIDENT FISH
4TH	ANADROMOUS FISH
5TH	WILDLIFE HABITAT
6TH	ENDANGERED SPECIES
7TH	WETLANDS

COLUMN NO.	LINE NO.	FORM 2 ITEM NO.	COLUMN HEADING	DESCRIPTION
8	1	669	SOCIAL IMPACT CODE	NINE CHARACTER SOCIAL IMPACT CODE IS DEFINED AS FOLLOWS:

CHARACTER POSITION	DESCRIPTION
1ST	CULTURAL AND HISTORICAL RESOURCES
2ND	COMMUNITIES RELOCATED
3RD	TRANSPORTATION RELOCATED
4TH	FARMLAND
5TH	LOCAL GROUP COMMENT
6TH	ENVIRONMENTAL GROUP COMMENT
7TH	OTHER GROUP COMMENT
8TH	UTILITY INTEREST
9TH	STATE COMMENT

Summary Listing of Existing and Potential Hydropower Projects, Alaska
Project Listing

SITE ID / DEP CODE, ACTV INV / GEOG. AREA	PROJECT NAME / PRIMARY CO. / OWNER / MAP REFERENCE	NAME OF STREAM	LATITUDE (D M.M) / LONGITUDE (D M.M) / DR.AREA (SQ.MI)	PROJ.PURP. / STATUS / AVE. Q (CFS)	DAM HT (FT) / TOT. STOR (AC FT) / PWR. HD. (FT)	EXIST.CAP. (KW) / INC. CAP. (KW) / TOT. CAP. (KW)	EXIST.ENRG (MWH) / INC.ENERGY (MWH) / TOT.ENERGY (MWH)	ANUL. COST (1000 $) / ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE / SOCIAL IMPACT CODE
AK7NPA0001	EAGLE RIVER		61 17.9	H	125.0	0	0	4674.3	YNUUUUU
I 5	ANCHORAGE	EAGLE RIVER	149 38.9	IS	0	13000	61000	76.629	
SO CENTRAL	UNDEVELOPED		194	549.0	166.8	13000	61000		UNNUUUUUN
	ANCHORAGE B-7.								
AK4NPA0049	WHITTIER TIDAL		60 49.7	H	75.0	0	0	0	NNUUUUU
I 9	ANCHORAGE	COOK INLET	149 9.5	IS	0	0	0	0	
SO CENTRAL	UNDEVELOPED			0	22.0	0	0		UNNUUUUNU
	SEWARD D-5,6.								
AK7NPA0005	ELIZA LAKE		57 12.0	H	20.0	0	0	893.52	YNUUUUU
I 5	ANGOON	ELIZA CREEK	134 19.9	IS	0	1700	7465	119.69	
SOUTHEAST	UNDEVELOPED		6	53.4	209.7	1700	7465		UNNUUUUUU
	SITKA A-1.								
AK6NPA0006	HASSELBORG CREEK		57 36.9	H	340.0	0	0	11040	YNUUUUU
I 5	ANGOON	HASSELBORG CR	134 18.0	IS	0	16000	77000	143.38	
SOUTHEAST	UNDEVELOPED		83	473.0	305.6	16000	77000		UNNUUUUUU
	SITKA C-1.								
AK6NPA0004	JIM'S LAKE		57 33.9	H	5.0	0	0	1382.7	YNUUUUU
I 5	ANGOON	JIM'S CREEK	134 18.9	IS	0	5000	20550	67.284	
SOUTHEAST	UNDEVELOPED		18	170.0	184.8	5000	20550		UNNUUUUUU
	SITKA C-1.								
AK6NPA0007	KATHLEEN CREEK		57 56.0	H	30.0	0	0	1974.0	YNUUUUU
I 6	ANGOON	KATHLEEN CREE	134 42.9	IS	48000	10000	48000	41.125	
SOUTHEAST	UNDEVELOPED		29	174.0	501.4	10000	48000		UNNUUUUUU
	SITKA D-3.								
AK7NPA0003	LAKE FLORENCE		57 48.1	H	25.0	0	0	2323.7	YNUUUUU
I 5	ANGOON	FLORENCE CREE	134 37.9	IS	0	4000	19000	122.30	
SOUTHEAST	UNDEVELOPED		39	270.0	109.8	4000	19000		UNNUUUUUU
	SITKA D-3								
AK6NPA2610	THAYER CREEK		57 36.5	H	390.0	0	0	6057.4	YNUUUUU
I 5	ANGOON	THAYER CREEK	134 31.0	IS	180000	16000	78000	77.659	
SOUTHEAST	UNDEVELOPED		61	348.0	376.6	16000	78000		UNNUUUUYU
	SITKA C-2.								
AK7NPA0009	AWUNA RIVER		69 0.9	H	200.0	0	0	15912	YNUUUUU
I 5	BARROW-N. SL	AWUNA RIVER	156 1.9	IS	0	21000	101000	157.54	
ARCTIC	UNDEVELOPED		605	317.0	528.0	21000	101000		UNNUNUUNN
	LOOKOUT RIDGE								

Project Listing(continued)

SITE ID / DEP CODE / ACTV INV / GEOG. AREA	PROJECT NAME / PRIMARY CO. -NAME OF STREAM / OWNER / MAP REFERENCE	LATITUDE (D M.M) / LONGITUDE (D M.M) / DR.AREA (SQ.MI)	PROJ.PURP. / STATUS / AVE. Q (CFS)	DAM HT (FT) / TOT. STOR (AC FT) / PWR. HD. (FT)	EXIST.CAP. (KW) / INC. CAP. (KW) / TOT. CAP. (KW)	EXIST.ENRG (MWH) / INC.ENERGY (MWH) / TOT.ENERGY (MWH)	ANUL. COST (1000 $) / ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE / SOCIAL IMPACT CODE
AK6NPA0010	KILLIK BEND	67 3.0	H	225.0	0	0	20868	NYUUUUU
I 6	BARROW-N. SL COLVILLE RIVE	153 52.0	IS	0	148000	718000	29. 64	
ARCTIC	UNDEVELOPED	9780	5658.0	217.7	148000	718000		UNNUNUUNN
	KILLIK RIVER							
AK6NPA0011	KUCHER CREEK	68 54.9	H	130.0	0	0	17756	YNUUUUU
I 6	BARROW-N. SL COLVILLE RIVE	155 45.0	IS	0	53000	254000	69.906	
ARCTIC	UNDEVELOPED	6240	3588.0	119.8	53000	254000		UNNUNUUNN
	KILLIK RIVER							
AK6NPA0008	KUKPUK	68 24.9	H	110.0	0	0	9208.8	NNUUUUU
I 5	BARROW-N. SL KUKPUK RIVER	165 59.0	IS	0	24000	105850	86.998	
NORTHWEST	UNDEVELOPED	2160	1590.0	99.9	24000	105850		UNNUUUUNU
	POINT HOPE B-2							
AK6NPA0012	KISARALIK RIVER	60 26.4	H	315.0	0	0	7431.4	YYUUUUU
I 2	BETHEL KISARALIK RIV	160 5.5	ID	716000	30000	131000	56.728	
SOUTHWEST	UNDEVELOPED	544	800.0	264.7	30000	131000		UNNUUUUUU
	BETHEL B-3.							
AK6NPA0013	ALAGNAK RIVER	59 1.1	H	210.0	0	0	5896.3	NYUUUUU
I 5	BRISTOL BAY ALAGNAK RIVER	156 3.0	IS	363000	18200	79700	73.981	
SOUTHWEST	UNDEVELOPED	530	2100.0	169.8	18200	79700		UNNUUUUNN
	ILIAMNA A-8.							
AK7NPA0014	AMERICAN CREEK	58 54.0	H	135.0	0	0	3279.2	YNUUUUU
I 5	BRISTOL BAY AMERICAN CREE	155 13.9	IS	1950	25000	120000	27.327	
SOUTHWEST	UNDEVELOPED	100	248.0	860.1	25000	120000		UNNUUUUNN
	MT. KATMAI D-4.							
AK6NPA0015	BECHAROF	58 9.0	H	56.0	0	0	35799	YNUUUUU
I 5	BRISTOL BAY EGGEGIK RIVER	156 48.0	IS	0	16000	76000	471. 4	
SOUTHWEST	UNDEVELOPED	1280	2208.0	57.9	16000	76000		UNNUUUUNN
	NAKNEK A-3							
AKHNPA2601	CHIGNIK	56 16.9	HS	5.0	50	438000	0	NNUUUUU
I 4	BRISTOL BAY INDIAN CREEK	158 24.8	OP	0	0	0	0	
SO CENTRAL	ALASKA PKRS. ASSN.	2	22.0	400.0	50	438000		UNNUUUUUU
	CHIGNIK B-2							
AK7NPA0016	CHIKUMINUK	60 10.0	H	10.0	0	0	8977.1	NNUUUUU
I 5	BRISTOL BAY ALLEN RIVER	158 26.0	IS	0	32000	154000	58.293	
SOUTHWEST	UNDEVELOPED	286	1104.0	261.7	32000	154000		UNNUUUUUU
	TAYLOR MTNS.							

Project Listing(continued)

SITE ID	PROJECT NAME		LATITUDE	PROJ.PURP.	DAM HT	EXIST.CAP.	EXIST.ENRG	ANUL. COST	ENVIRONMENTAL IMPACT CODE
	PRIMARY CO.	-NAME OF STREAM	LONGITUDE	STATUS	TOT. STOR	INC. CAP.	INC.ENERGY	ENERGY COST	
DEP ACTV	OWNER		DR.AREA	AVE. Q	PWR. HD.	TOT. CAP.	TOT.ENERGY		
CODE INV	MAP REFERENCE		(D M.M)		(FT)	(KW)	(MWH)	(1000 $)	
			(D M.M)		(AC FT)	(KW)	(MWH)	($/MWH)	SOCIAL
GEOG. AREA			(SQ.MI)	(CFS)	(FT)	(KW)	(MWH)		IMPACT CODE
AK7NPA0017	CONTACT CREEK		58 12.0	H	20.0	0	0	1326.7	YNUUUUU
I 5	BRISTOL BAY	CONTACT CREEK	155 57.9	IS	0	5000	23000	57.684	
SOUTHWEST	UNDEVELOPED		54	127.0	273.7	5000	23000		UNNUUUUNN
	MT KATMAI A-6								
AK7NPA0018	GRANT LAKE		59 45.9	H	56.0	0	0	1848.5	NNUUUUU
I 2	BRISTOL BAY	WOOD RIVER	158 32.0	IS	52500	2700	12672	145.87	
SOUTHWEST	UNDEVELOPED		37	96.0	209.7	2700	12672		UNNUUUUUU
	DILLINGHAM D-7,D-8								
AK7NPA0019	GROSVENOR LAKE		58 40.0	H	50.0	0	0	7418.1	YNUUUUU
I 5	BRISTOL BAY	SAVONOSKI RIV	155 25.3	IS	0	24000	105000	70.648	
SOUTHWEST	UNDEVELOPED		630	1386.0	113.8	24000	105000		UNNUUUUNN
	MT KATMAI C-3,C-4,C-5								
AK6NPA0020	INGERSOL		60 28.0	H	800.0	0	0	51103	YNUUUUU
I 5	BRISTOL BAY	KIJIK RIVER	154 3.9	IS	0	144000	630000	81.116	
SOUTHWEST	UNDEVELOPED		300	960.0	1118.8	144000	630000		UNNUUUUNN
	LAKE CLARK B-3.								
AK7NPA0021	KAKHONAK LAKE		59 15.0	H	5.0	0	0	4302.7	NNUUUUU
I 5	BRISTOL BAY	KAKHONAK RIVE	155 40.0	IS	0	11000	50000	86. 54	
SOUTHWEST	UNDEVELOPED		145	380.0	200.0	11000	50000		UNNUUUUNN
	ILIAMNA B-4								
AK7NPA0022	KONTRASHIBUNA		60 16.9	H	50.0	0	0	3882.0	YNUUUUU
I 5	BRISTOL BAY	TANALAN RIVER	154 15.0	IS	0	17000	83000	46.771	
SOUTHWEST	UNDEVELOPED		200	636.0	225.7	17000	83000		UNNUUUUUU
	LAKE CLARK A-4.								
AK7NPA0023	KUKAKLEK		59 18.9	H	40.0	0	0	8554.6	NYUUUUU
I 6	BRISTOL BAY	ALAGNAK RIVER	155 33.0	IS	900000	53000	232000	36.873	
SOUTHWEST	UNDEVELOPED		480	1202.0	325.6	53000	232000		UNNUUUUUU
	ILIAMNA A-7.								
AK6NPA0024	KULIK LAKE		58 59.0	H	55.0	0	0	4804.9	YNUUUUU
I 5	BRISTOL BAY	KULIK LAKE	155 7.0	IS	0	7000	34000	141.32	
SOUTHWEST	UNDEVELOPED		236	520.0	99.9	7000	34000		UNNUUUUUU
	MT. KATMAI								
AK6NPA0025	KULIK LAKE		59 46.9	H	50.0	0	0	6038.5	YNUUUUU
I 5	BRISTOL BAY	WIND RIVER	158 11.9	IS	0	20000	95000	63.563	
SOUTHWEST	UNDEVELOPED		236	5244.0	29.9	20000	95000		UNNUUUUNN
	DILLINGHAM								

Project Listing(continued)

SITE ID DEP ACTV CODE INV GEOG. AREA	PROJECT NAME PRIMARY CO. -NAME OF STREAM OWNER MAP REFERENCE	LATITUDE LONGITUDE DR.AREA (D M.M) (D M.M) (SQ.MI)	PROJ.PURP. STATUS AVE. Q (CFS)	DAM HT TOT. STOR PWR. HD. (FT) (AC FT) (FT)	EXIST.CAP. INC. CAP. TOT. CAP. (KW) (KW) (KW)	EXIST.ENRG INC.ENERGY TOT.ENERGY (MWH) (MWH) (MWH)	ANUL. COST ENERGY COST (1000 $) ($/MWH)	ENVIRONMENTAL IMPACT CODE SOCIAL IMPACT CODE
AK7NPA0155	LAKE ELVA	59 37.9		137.0	0	0	2324.6	NNNNNNN
I 2	BRISTOL BAY ELVA CREEK	159 0.0		29000	1000	8000	290.58	
SOUTHWEST	UNDEVELOPED	10	52.2	259.7	1000	8000		NNNNUUUYU
	GOODNEWS BAY C-1							
AK6NPA0027	LAKE ILIAMNA	59 13.0	H	120.0	0	0	42200	NNUYUUU
I 6	BRISTOL BAY KVICHAK MINOR	156 26.0	IS	0	313000	1370000	30.803	
SOUTHWEST	UNDEVELOPED	6440	20167.0	113.8	313000	1370000		UYYUUUUNU
	DILLINGHAM A-2.							
AK6NPA0038	NAKNEK	58 36.9	H	170.0	0	0	21313	YNUUUUU
I 5	BRISTOL BAY NAKNEK RIVER	156 29.0	IS	0	108000	473000	45. 59	
SOUTHWEST	UNDEVELOPED	2720	6354.0	123.8	108000	473000		UNNUUUUNU
	NAKNEK C-2.							
AK7NPA0028	NEWHALEN	59 45.0	H	35.0	0	0	16041	NNUYUUU
I 5	BRISTOL BAY NEWHALEN RIVE	154 49.9	IS	0	85000	411000	39. 31	
SOUTHWEST	UNDEVELOPED	3319	9212.0	73.9	85000	411000		UYYUNUUNU
	ILIAMNA D-6.							
AK7NPA0029	NISHLIK LAKE	60 27.0	H	28.0	0	0	2299.6	NNUUUUU
D 5	BRISTOL BAY TIKCHIK RIVER	158 51.0	IS	0	4000	18000	127.75	
SOUTHWEST	UNDEVELOPED	46	135.0	202.7	4000	18000		UNNUUUUUU
	TAYLOR MTN B-8							
AK7NPA0031	NONVIANUK LAKE	59 1.9	H	5.0	0	0	3069.8	YNUUUUU
I 5	BRISTOL BAY NONUIANUK RIV	155 37.8	IS	0	13000	63000	48.727	
SOUTHWEST	UNDEVELOPED	370	925.0	114.8	13000	63000		UNNUUUUNU
	ILIAMNA A-7							
AK7NPA0032	TAZIMINA	59 58.0	H	45.0	0	0	3809.8	YNYYNNN
I 2	BRISTOL BAY TAZIMINA RIVE	154 33.0	IS	148000	18000	224000	17. 8	
SOUTHWEST	UNDEVELOPED	320	1440.0	180.0	18000	224000		UNNUUUUUU
	ILIAMNA D-5.							
AK7NPA0030	TIKCHIK	59 56.0	H	35.0	0	0	17046	NNUUYUY
D 5	BRISTOL BAY NUYAKUK RIVER	158 11.9	IS	0	127000	555000	30.714	
SOUTHWEST	UNDEVELOPED	1530	5940.0	175.8	127000	555000		UNNUUUUNN
	DILLINGHAM D-6.							
AK7NPA0034	UGASHIK LAKE	57 36.9	H	37.0	0	0	10356	YNUUUUU
I 5	BRISTOL BAY UGASHIK RIVER	157 0.9	IS	0	6000	30000	345.23	
SOUTHWEST	UNDEVELOPED	830	1518.0	32.9	6000	30000		UNNUNUUNN
	UGASHIK C-3							

Project Listing(continued)

SITE ID DEP ACTV CODE INV GEOG. AREA	PROJECT NAME PRIMARY CO. -NAME OF STREAM OWNER MAP REFERENCE	LATITUDE (D M.M) LONGITUDE (D M.M) DR.AREA (SQ.MI)	PROJ.PURP. STATUS AVE. Q (CFS)	DAM HT (FT) TOT. STOR (AC FT) PWR. HD. (FT)	EXIST.CAP. (KW) INC. CAP. (KW) TOT. CAP. (KW)	EXIST.ENRG (MWH) INC.ENERGY (MWH) TOT.ENERGY (MWH)	ANUL. COST (1000 $) ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE SOCIAL IMPACT CODE
AK7NPA0035	UKAK	58 28.0	H	75.0	0	0	4849.2	YNUUUUU
I 5	BRISTOL BAY UKAK RIVER	155 40.0	IS	0	6000	30000	161.64	
SOUTHWEST	UNDEVELOPED	194	455.0	144.8	6000	30000		UNNUUUUNU
	MT. KATMAI B-4							
AK7NPA0037	UKAK RIVER	58 30.9	H	125.0	0	0	3745.8	YNUUUUU
I 5	BRISTOL BAY UKAK RIVER	155 19.9	IS	0	10000	43933	85.263	
SO CENTRAL	UNDEVELOPED	194	455.0	144.8	10000	43933		UNNUUUUNU
	MT KATMAI B-4							
AK7NPA0036	UPNUK LAKE	60 18.9	H	50.0	0	0	4236.7	NNUUUUU
I 5	BRISTOL BAY TIKCHIK RIVER	158 46.2	IS	0	8000	39000	108.63	
SOUTHWEST	UNDEVELOPED	100	3864.0	169.8	8000	39000		UNNUUUUNU
	TAYLOR MTN B-8							
AK6NPA0042	BREMNER RIVER LITTLE	60 59.0	H	300.0	0	0	5821.4	YNUUUUU
I 5	CORDOVA-MCCA LITTLE BREMNE	144 8.9	IS	0	15000	70000	83.164	
SO CENTRAL	UNDEVELOPED	182	694.0	271.7	15000	70000		UNNUUUUUU
	VALDEZ A-2.							
AK6NPA0043	BREMNER RIVER SF	60 56.0	H	550.0	0	0	11321	YNUUUUU
I 6	CORDOVA-MCCA S FORK BREMNE	144 8.9	IS	0	32000	156000	72.572	
SO CENTRAL	UNDEVELOPED	148	649.0	536.4	32000	156000		UNNUUUUUU
	CORDOVA D-1							
AK6NPA0044	BREMNER RIVER NF	60 58.0	H	510.0	0	0	24548	YNUUUUU
I 5	CORDOVA-MCCA N FORK BREMNE	143 41.9	IS	0	35000	166000	147.68	
SO CENTRAL	UNDEVELOPED	150	649.0	489.5	35000	166000		UNNUUUUNU
	BERING GLACIER D-8.							
AK6NPA0045	BREMNER RIVER SALMON	61 0.0	H	190.0	0	0	9027.4	YNUUUUU
I 5	CORDOVA-MCCA BREMNER RIVER	144 0.0	IS	1575000	18000	86000	104.96	
SO CENTRAL	UNDEVELOPED	660	2898.0	165.8	18000	86000		UNNUUUUNU
	VALDEZ A-1.							
AK7NPA0046	CANYON CREEK	61 4.9	H	1250.0	0	0	76056	YNUUUUU
I 5	CORDOVA-MCCA CANYON CREEK	142 10.0	IS	0	27000	131000	580.58	
SO CENTRAL	UNDEVELOPED	100	373.0	1306.6	27000	131000		UNNUUUUUU
	MCCARTHY A-4.							
AK6NPA0047	CLEAVE (PENINSULA)	61 4.9	H	250.0	0	0	58965	NYUUUUU
I 6	CORDOVA-MCCA COPPER RIVER	144 48.9	IS	0	820000	3600000	16.379	
SO CENTRAL	UNDEVELOPED	21500	38676.0	164.8	820000	3600000		UNNUUUUNU
	VALDEZ A-3,B-2,B-3.							

Project Listing(continued)

SITE ID / DEP CODE, ACTV INV / GEOG. AREA	PROJECT NAME / PRIMARY CO. -NAME OF STREAM / OWNER / MAP REFERENCE	LATITUDE (D M.M) / LONGITUDE (D M.M) / DR.AREA (SQ.MI)	PROJ.PURP. / STATUS / AVE. Q (CFS)	DAM HT (FT) / TOT. STOR (AC FT) / PWR. HD. (FT)	EXIST.CAP. / INC. CAP. / TOT. CAP. (KW)	EXIST.ENRG / INC.ENERGY / TOT.ENERGY (MWH)	ANUL. COST (1000 $) / ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE / SOCIAL IMPACT CODE
AK7NPA0033	CRATER LAKE	60 34.7	H	5.0	0	0	279. 2	NNYUUUU
I 5	CORDOVA-MCCA CRATER LAKE	145 40.8	FP	0	389	1435	194.44	
SO CENTRAL	UNDEVELOPED	0	2.0	1348.6	389	1435		NNNUYUUNN
	CORDOVA C-5.							
AK7NPA0048	HANAGTA LAKE	61 27.0	H	73.0	0	0	5289.3	YNUUUUU
I 5	CORDOVA-MCCA HANAGTA RIVER	144 3.9	IS	0	33000	160000	33. 58	
SO CENTRAL	UNDEVELOPED	100	314.0	1008.9	33000	160000		UNNUUUUNU
	MCCARTHY A-8.							
AK7NPA0026	HUMPBACK CREEK	60 37.8	H	5.0	0	0	470.45	YNUUUUU
I 5	CORDOVA-MCCA HUMPBACK CREE	145 37.8	FP	0	1010	3296	142.73	
SO CENTRAL	UNDEVELOPED	2	25.0	349.6	1010	3296		UNNUUUNNN
	CORDOVA C-5.							
AK7NPA0050	KIAGNA RIVER	61 2.2	H	510.0	0	0	16251	YNUUUUU
I 5	CORDOVA-MCCA KIAGNA RIVER	142 24.5	IS	0	40000	193000	84.207	
SO CENTRAL	UNDEVELOPED	185	676.0	969.0	40000	193000		UNNUUUUUU
	MCCARTHY A-4.							
AK7NPA0051	KLUTINA	61 32.9	H	98.0	0	0	7526.5	NNUYYUU
I 5	CORDOVA-MCCA KLUTINA RIVER	145 27.9	IS	692000	54000	263000	28.618	
SO CENTRAL	UNDEVELOPED	670	1311.0	334.6	54000	263000		UNNUUUUYU
	VALDEZ D-5.							
AK7NPA0052	KUSKULANA RIVER	61 32.9	H	310.0	0	0	7771.9	YNUUUUU
I 5	CORDOVA-MCCA KUSKULANA RIV	143 56.9	IS	0	24000	114000	68.175	
SO CENTRAL	UNDEVELOPED	260	759.0	507.4	24000	114000		UNNUUUUUU
	MCCARTHY C-8.							
AK6NPA0053	LOWE (KEYSTONE CAN)	61 5.9	H	440.0	0	0	9304.4	NNUYUUU
I 6	CORDOVA-MCCA LOWE RIVER	145 30.0	IS	240000	55000	254000	36.631	
SO CENTRAL	UNDEVELOPED	190	1934.0	323.6	55000	254000		UNNUYYUYU
	VALDEZ A-6,A-5.							
AK6NPA0054	MILLION DOLLAR	60 40.0	H	110.0	0	0	52833	NYUUUUU
I 5	CORDOVA-MCCA COPPER RIVER	144 44.0	IS	0	440000	1927000	27.417	
SO CENTRAL	UNDEVELOPED	24200	52489.0	88.9	440000	1927000		UNNUUUUUU
	CORDOVA C-2,D-2.							
AK7NPA0055	NIZINA	61 23.1	H	340.0	0	0	15020	YNUUUUU
I 6	CORDOVA-MCCA NIZINA RIVER	143 13.9	IS	0	45000	199200	75.403	
SO CENTRAL	UNDEVELOPED	1420	3450.0	329.6	45000	199200		UNNUUUUUU
	MCCARTHY B-6							

Project Listing(continued)

SITE ID DEP CODE / ACTV INV GEOG. AREA	PROJECT NAME PRIMARY CO. -NAME OF STREAM OWNER MAP REFERENCE	LATITUDE (D M.M) LONGITUDE (D M.M) DR.AREA (SQ.MI)	PROJ.PURP. STATUS AVE. Q (CFS)	DAM HT (FT) TOT. STOR (AC FT) PWR. HD. (FT)	EXIST.CAP. (KW) INC. CAP. (KW) TOT. CAP. (KW)	EXIST.ENRG (MWH) INC.ENERGY (MWH) TOT.ENERGY (MWH)	ANUL. COST (1000 $) ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE SOCIAL IMPACT CODE
AK5NPA0039 D 2 SO CENTRAL	POWER CREEK 1 CORDOVA-MCCA POWER CREEK UNDEVELOPED CORDOVA C-5.	60 35.1 145 32.4 21	H SP 251.0	25.0 0 359.6	0 5000 5000	0 26000 26000	2687.0 103.34	NNYYNUN NNNNYNUYY
AK7NPA0040 E 5 SO CENTRAL	POWER CREEK 2 CORDOVA-MCCA POWER CREEK UNDEVELOPED CORDOVA C-5.	60 36.9 145 31.4 15	H SP 160.0	165.0 0 499.5	0 10500 10500	0 50000 50000	8326.6 166.53	NNUUUUU UNNUUUUUU
AK7NPA0057 I 5 SO CENTRAL	POWER CREEK CORDOVA-MCCA POWER CREEK UNDEVELOPED CORDOVA C-5	60 35.9 145 30.9 19	H FP 283.0	10.0 104000 360.0	0 14000 14000	0 66000 66000	2404.4 36.431	YNUUUUU UNNUNUUYU
AK7NPA0058 I 5 SO CENTRAL	TEBAY LAKE CORDOVA-MCCA TEBAY RIVER UNDEVELOPED VALDEZ A-1,A-2.	61 26.0 144 11.9 105	H IS 331.0	85.0 0 1005.9	0 40000 40000	0 193000 193000	6323.6 32.764	YNNUUUU UNNUUUUUU
AK6NPA0059 I 5 SO CENTRAL	THREE MILE CANYON CORDOVA-MCCA BREMNER RIVER UNDEVELOPED CORDOVA D-1	60 59.0 144 10.0 526	H IS 2291.0	230.0 0 227.7	0 26000 26000	0 127000 127000	6339.7 49.919	YNUUUUU UNNUUUUUU
AK6NPA0060 I 5 SO CENTRAL	TIEKEL RIVER CORDOVA-MCCA TIEKEL RIVER UNDEVELOPED VALDEZ A-3.	61 14.7 144 57.6 421	H IS 830.0	430.0 0 379.6	0 22000 22000	0 105000 105000	7918.7 75.416	NNNNYNN UNNNYYYYY
AK7NPA0002 I 5 SO CENTRAL	TONSINA CORDOVA-MCCA TONSINA RIVER UNDEVELOPED VALDEZ C-4.	61 30.0 145 30.0 255	H SP 566.0	75.0 0 506.4	0 44000 44000	0 191000 191000	8238.0 43.131	NNUUUUU UNNUUUUUU
AK6NPA0061 I 5 SO CENTRAL	TSINA CORDOVA-MCCA TSINA UNDEVELOPED VALDEZ A-4.	61 9.0 145 30.9 104	H IS 304.0	390.0 0 359.6	0 12000 12000	0 58000 58000	7456.5 128.56	NNUUUUU UNNUUUUUU
AK7NPA0062 I 5 SO CENTRAL	VAN CLEVE CORDOVA-MCCA UNNAMED UNDEVELOPED CORDOVA C-1	60 42.0 144 24.9 17	H IS 131.0	20.0 0 474.5	0 2000 2000	0 10000 10000	1885.5 188.55	YNUUUUU UNNUUUUUU

Project Listing(continued)

SITE ID	PROJECT NAME	LATITUDE	PROJ.PURP.	DAM HT	EXIST.CAP.	EXIST.ENRG	ANUL. COST	ENVIRONMENTAL
	PRIMARY CO. -NAME OF STREAM	LONGITUDE	STATUS	TOT. STOR	INC. CAP.	INC.ENERGY	ENERGY COST	IMPACT CODE
DEP ACTV	OWNER	DR.AREA	AVE. Q	PWR. HD.	TOT. CAP.	TOT.ENERGY		
CODE INV	MAP REFERENCE	(D M.M)		(FT)	(KW)	(MWH)	(1000 $)	
		(D M.M)		(AC FT)	(KW)	(MWH)	($/MWH)	SOCIAL
GEOG. AREA		(SQ.MI)	(CFS)	(FT)	(KW)	(MWH)		IMPACT CODE
AK7NPA0063	WHITE RIVER	60 4.8	H	5.0	0	0	1338.3	NNUUUUU
I 5	CORDOVA-MCCA WHITE RIVER	142 9.9	IS	0	2172	15791	84.753	
SO CENTRAL	UNDEVELOPED	29	290.0	281.7	2172	15791		UNNUYYYNY
	BERING GLACIER A-4.							
AK6NPA0064	WOOD CANYON	61 25.0	H	1000.0	0	0	370973	YNUUUUU
I 6	CORDOVA-MCCA COPPER RIVER	144 19.9	IS	14500000	3600000	21900000	16.939	
SO CENTRAL	UNDEVELOPED	20600	36880.0	949.0	3600000	21900000		UNNUUUUUU
	VALDEZ B-2.							
AK7NPA0065	YOUNG CREEK	61 12.2	H	210.0	0	0	5189.5	YNUUUUU
I 5	CORDOVA-MCCA YOUNG CREEK	142 23.9	IS	0	17000	82000	63.286	
SO CENTRAL	UNDEVELOPED	40	152.0	2014.9	17000	82000		UNNUUUUNU
	MCCARTHY A-4.							
AK6NPA0066	CHATANIKA RIVER	65 2.0	H	105.0	0	0	5236.8	NNUUUUU
I 6	FAIRBANKS CHATANIKA RIV	148 31.0	IS	440000	12625	32000	163.65	
YUKON	UNDEVELOPED	770	580.0	90.9	12625	32000		UNNUUUUYU
	LIVENGOOD A-4.							
AK6NPA0067	CHENA RIVER	64 54.0	H	110.0	0	0	6511.4	NNUUYUU
I 5	FAIRBANKS CHENA RIVER	146 22.0	IS	270000	10000	46000	141.55	
YUKON	UNDEVELOPED	950	905.0	106.8	10000	46000		UNNUNUUUU
	BIG DELTA D-5.							
AK6NPA0069	TANANA RIVER (LITTLE DELTA)	64 30.0	H	140.0	0	0	19347	NNUYUUU
D 6	FAIRBANKS TANAN RIVER	146 45.0	IS	0	65000	315000	61.419	
YUKON	UNDEVELOPED	18080	20010.0	106.8	65000	315000		UYYUUUUYU
	BIG DELTA B-6.							
AK6NPA0072	CHILKAT	59 38.0	H	410.0	0	0	7472.9	NNUYYUU
I 5	HAINES DIV CHILKAT RIVER	135 56.0	IS	0	41000	180000	41.516	
SOUTHEAST	UNDEVELOPED	190	1202.0	319.6	41000	180000		UNNUUUUNU
	SKAGWAY C-3.							
AK6NPA0071	CHILKOOT	59 19.9	H	180.0	0	0	5999.2	NNUUUUU
I 5	HAINES DIV CHILKOTT RIVE	135 32.0	IS	0	16000	78000	76.913	
SOUTHEAST	UNDEVELOPED	130	1076.0	135.8	16000	78000		UYYUNYNNY
	SKAGWAY B-2.							
AK1NPA0098	ANNEX	58 19.5	H	25.0	3500	6000	171.52	NNUUUUU
I 2	JUNEAU ANNEX CREEK	134 7.6	OP	23400	1750	3000	57.176	
SOUTHEAST	ALASKA ELEC LGT AND PWR	6	-63.4	755.0	5250	9000		UNNUUUUUU
	JUNEAU B-1							

Project Listing(continued)

SITE ID / DEP CODE, ACTV INV / GEOG. AREA	PROJECT NAME / PRIMARY CO. / OWNER / MAP REFERENCE	NAME OF STREAM	LATITUDE (D M.M) / LONGITUDE (D M.M) / DR.AREA (SQ.MI)	PROJ.PURP. / STATUS / AVE. Q (CFS)	DAM HT (FT) / TOT. STOR (AC FT) / PWR. HD. (FT)	EXIST.CAP. (KW) / INC. CAP. (KW) / TOT. CAP. (KW)	EXIST.ENRG (MWH) / INC.ENERGY (MWH) / TOT.ENERGY (MWH)	ANUL. COST (1000 $) / ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE / SOCIAL IMPACT CODE
AK7NPA0090	BEAR CREEK		58 3.9	H	10.0	0	0	1567.7	NNUUUUU
I 5	JUNEAU	BEAR CREEK	134 0.0	IS	0	18000	44000	35.629	
SOUTHEAST	UNDEVELOPED		3	25.0	849.1	18000	44000		UNNUYYYYY
	JUNEAU A-1.								
AK7NPA0091	BOUNDARY LAKE		58 34.9	H	110.0	0	0	3604.6	NNUUUUU
I 5	JUNEAU	BOUNDARY CREE	133 40.0	IS	0	20000	95000	37.943	
SOUTHEAST	UNDEVELOPED		23	235.0	794.2	20000	95000		UNNUUUUNU
	TAKU RIVER C-6.								
AK7NPA0092	CARLSON CREEK		58 5.9	H	185.0	0	0	4926.1	YNUUUUU
I 5	JUNEAU	CARLSON CREEK	134 17.0	IS	0	10000	46000	107. 8	
SOUTHEAST	UNDEVELOPED		24	339.0	343.6	10000	46000		UNNUUUUNU
	JUNEAU B-1.								
AK7NPA2604	COWEE CREEK		58 38.0	H	10.0	0	0	1078.1	NNUUUUU
I 5	JUNEAU	COWEE CREEK	134 54.2	IS	0	6000	25560	42.181	
SOUTHEAST	UNDEVELOPED		7	-44.4	480.0	6000	25560		UNNUUUUUU
	JUNEAU C-3.								
AK7NPA0356	CRATER LAKE		58 8.0	H	55.0	0	0	3229.5	NNNNNNN
D 2	JUNEAU	CRATER CREEK	133 45.7	IS	0	27000	106000	30.467	
SOUTHEAST	UNDEVELOPED		12	185.0	979.0	27000	106000		NNNUYUUYY
	TAKU A-6.								
AK7NPA2607	DAVIDSON CREEK		58 21.3	H	60.0	0	0	1509.3	NNUUUUU
I 6	JUNEAU	DAVIDSON CREE	133 44.5	IS	0	2736	119836	12.594	
SOUTHEAST	UNDEVELOPED		30	-247.6	89.9	2736	119836		UNNUUUUUU
	TAKU RIVER B-6.								
AK7NPA2608	DAVIES CREEK		58 38.4	H	150.0	0	0	3657.4	NNUUUUU
I 5	JUNEAU	DAVIES CREEK	134 54.2	IS	0	5000	25382	144. 9	
SOUTHEAST	UNDEVELOPED		18	102.0	305.0	5000	25382		UNNUUUUUU
	JUNEAU C-3.								
AK6NPA0093	ENDICOTT RIVER		58 47.4	H	520.0	0	0	10077	NNUUUUU
I 5	JUNEAU	ENDICOTT RIVE	135 27.9	IS	704000	21000	105000	95.974	
SOUTHEAST	UNDEVELOPED		56	373.0	462.5	21000	105000		UNNUUUUUU
	JUNEAU D-5.								
AKHNPA0099	GOLD CREEK S		58 17.9	H	5.0	1600	6800	312.98	NNUUUUU
I 2	JUNEAU	GOLD CREEK	134 23.9	OP	0	2000	8968	34.899	
SOUTHEAST	ALASKA ELECTRIC LIGHT & POWE		10	-57.7	225.0	3600	15768		UNNUUUUUU
	JUNEAU B-2								

Project Listing(continued)

SITE ID / DEP CODE ACTV INV / GEOG. AREA	PROJECT NAME / PRIMARY CO. / OWNER / MAP REFERENCE	NAME OF STREAM	LATITUDE (D M.M) / LONGITUDE (D M.M) / DR.AREA (SQ.MI)	PROJ.PURP. / STATUS	AVE. Q (CFS)	DAM HT (FT) / TOT. STOR (AC FT) / PWR. HD. (FT)	EXIST.CAP. (KW) / INC. CAP. (KW) / TOT. CAP. (KW)	EXIST.ENRG (MWH) / INC.ENERGY (MWH) / TOT.ENERGY (MWH)	ANUL. COST (1000 $) / ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE / SOCIAL IMPACT CODE
AK6NPA0095	LACE RIVER		58 57.0	H		210.0	0	0	17264	NNYYYYY
I 5	JUNEAU	LACE RIVER	134 57.9	IS		0	62000	298000	57.934	
SOUTHEAST	UNDEVELOPED		393		3174.0	165.8	62000	298000		UNNUUUUUU
	JUNEAU D-3.									
AK5NPA0096	LAKE DOROTHY		58 14.0	H		5.0	0	0	2286.3	NNUUUUU
I 2	JUNEAU	DOROTHY CREEK	134 3.0	IS		165000	34000	150000	15.242	
SOUTHEAST	UNDEVELOPED		11		112.0	2347.6	34000	150000		UNNUYYYYY
	TAKU RIVER A-6.									
AK7NPA0073	LEMON CREEK		58 20.9	H		230.0	0	0	3722.3	NNUUUUU
I 5	JUNEAU	LEMON CREEK	134 30.0	IS		18000	10000	43000	86.566	
SOUTHEAST	UNDEVELOPED		25		280.0	239.7	10000	43000		UNNUNYNYY
	JUNEAU B-2									
AK6NPA0075	NUGGET CREEK		58 25.0	H		120.0	0	0	1532.7	NNUUUUU
I 5	JUNEAU	NUGGET CREEK	134 30.9	IS		0	6000	30000	51. 90	
SOUTHEAST	UNDEVELOPED		16		208.0	606.3	6000	30000		UNNUUUUUU
	JUNEAU B-2									
AK7NPA0076	PETERSON LAKE		58 26.6	H		50.0	0	0	1278.5	NNUUUUU
I 5	JUNEAU	PETERSON LAKE	134 44.0	IS		7700	6000	26986	47.379	
SOUTHEAST	UNDEVELOPED		6		23.0	669.3	6000	26986		UNNUYYYYY
	JUNEAU B-3									
AK7NPA0077	RHINE CREEK		58 13.4	H		22.0	0	0	554.66	NNUUUUU
I 5	JUNEAU	RHINE CREEK	134 10.8	IS		0	1200	1570	353.28	
SOUTHEAST	UNDEVELOPED		4		29.1	389.6	1200	1570		UNNUYYYYY
	JUNEAU A-1									
AKINPA0101	SALMON CREEK NO 2		58 17.9	H		167.0	2800	5000	276.86	NNUUUUU
I 5	JUNEAU	UPPER SALMON	134 23.9	OP		19000	2800	0	0	
SOUTHEAST	AJINDUSTRIESINC		5		-52.8	640.0	5600	5000		UNNUUUUUU
	JUNEAU B-2									
AKJNPA0100	SALMON CREEK NO 1		58 17.9	H		167.0	2800	3000	0	NNUUUUU
I 4	JUNEAU	LOWER SALMON	134 30.0	OP		19000	0	0	0	
SOUTHEAST	AK ELE LT & PWR CO		6		-63.4	390.0	2800	3000		UNNUUUUUU
	JUNEAU B-2									
AK6NPA0079	SHEEP		58 15.0	H		180.0	0	0	2001.7	NNUUUUU
I 5	JUNEAU	SHEEP CREEK	134 18.9	IS		0	6000	26144	76.567	
SOUTHEAST	UNDEVELOPED		15		51.0	769.2	6000	26144		UNNUUUUUU
	JUNEAU B-1.									

Project Listing(continued)

SITE ID	PROJECT NAME		LATITUDE	PROJ.PURP.	DAM HT	EXIST.CAP.	EXIST.ENRG	ANUL. COST	ENVIRONMENTAL
	PRIMARY CO.	-NAME OF STREAM	LONGITUDE	STATUS	TOT. STOR	INC. CAP.	INC.ENERGY	ENERGY COST	IMPACT CODE
DEP ACTV	OWNER		DR.AREA	AVE. Q	PWR. HD.	TOT. CAP.	TOT.ENERGY		
CODE INV	MAP REFERENCE		(D M.M)		(FT)	(KW)	(MWH)	(1000 $)	
			(D M.M)		(AC FT)	(KW)	(MWH)	($/MWH)	SOCIAL
GEOG. AREA			(SQ.MI)	(CFS)	(FT)	(KW)	(MWH)		IMPACT CODE
AK7NPA0080	SHERMAN CREEK		58 51.9	H	10.0	0	0	452.41	NNUUUUU
I 5	JUNEAU	SHERMAN CREEK	135 8.1	IS	0	1200	4880	92.707	
SOUTHEAST	UNDEVELOPED		4	-18.8	390.0	1200	4880		UNNUUUUNU
	JUNEAU D-4.								
AK6NPA0081	SLIDE		58 0.0	H	40.0	0	0	1383.6	YNUUUUU
I 6	JUNEAU	SLIDE LAKE	134 22.0	IS	0	7000	31124	44.454	
SOUTHEAST	UNDEVELOPED		14	85.0	549.4	7000	31124		UNNUUUUUU
	JUNEAU A-2.								
AKJNPA0102	SNETTISHAM		58 5.9	H	10.0	47160	168500	1600.0	YNNNUNN
I 2	JUNEAU	LONG LAKE	133 48.0	OP	150000	0	57109	28. 16	
SOUTHEAST	AK POWER ADMIN.		30	447.0	799.2	225609	225609		NNNNYNYYY
	TAKU RIVER A-6								
AK6NPA0082	SPEEL DIVISION		58 6.9	H	325.0	0	0	9032.7	NNUUUUU
I 2	JUNEAU	SPEEL RIVER	133 42.9	IS	910000	63000	275000	32.846	
SOUTHEAST	UNDEVELOPED		194	-2314.5	272.7	63000	275000		UNNUUUUUU
	TAKU RIVER A-5.								
AK7NPA0083	SWEETHEART FALLS		57 56.6	H	150.0	0	0	4850.2	NNUUUUU
I 2	JUNEAU	SWEETHEART CR	133 38.1	IS	206000	29000	127000	38.190	
SOUTHEAST	UNDEVELOPED		35	328.0	611.3	29000	127000		UNNUYYYYY
	SUMDUM D-5								
AK7NPA0084	TEASE		58 5.9	H	80.0	0	0	2059.9	NNUUUUU
I 2	JUNEAU	TEASE CREEK	133 40.2	IS	22000	16000	70000	29.428	
SOUTHEAST	UNDEVELOPED		11	152.0	1032.9	16000	70000		UNNUYYYYY
	TAKU RIVER A-5.								
AKMNPA0086	TREADWELL DITCH		58 15.5	H	5.0	0	0	257. 0	NNUUUUU
I 2	JUNEAU	TREADWELL DIT	134 22.3	IS	0	2500	10000	25.700	
SOUTHEAST	AK ELET LIGHT & POWER		13	75.0	517.4	2500	10000		UNNUUUUYU
	JUNEAU B-2,A-2								
AK7NPA0087	TURNER LAKE		58 18.7	H	70.0	0	0	2896.0	NNUUUUU
I 5	JUNEAU	TURNER CREEK	133 57.3	IS	206000	5000	21900	132.24	
SOUTHEAST	UNDEVELOPED		52	-496.9	104.8	5000	21900		UNNUYYYYY
	TAKU RIVER B-6.								
AK7NPA0088	UNNAMED LAKE NEAR LACE RIVER		58 53.0	H	20.0	0	0	1443.1	NNUUUUU
I 5	JUNEAU	UNNAMED	134 49.9	IS	0	10000	48000	30. 66	
SOUTHEAST	UNDEVELOPED		3	28.0	299.7	10000	48000		UNNUYYYNY
	JUNEAU D-3.								

Project Listing(continued)

SITE ID	PROJECT NAME	LATITUDE	PROJ.PURP.	DAM HT	EXIST.CAP.	EXIST.ENRG	ANUL. COST	ENVIRONMENTAL IMPACT CODE
	PRIMARY CO. -NAME OF STREAM	LONGITUDE	STATUS	TOT. STOR	INC. CAP.	INC.ENERGY	ENERGY COST	
DEP ACTV	OWNER	DR.AREA	AVE. Q	PWR. HD.	TOT. CAP.	TOT.ENERGY		
CODE INV	MAP REFERENCE	(D M.M)		(FT)	(KW)	(MWH)	(1000 $)	
		(D M.M)		(AC FT)	(KW)	(MWH)	($/MWH)	SOCIAL
GEOG. AREA		(SQ.MI)	(CFS)	(FT)	(KW)	(MWH)		IMPACT CODE
AK7NPA0143	UPPER SWEETHEART	57 59.7	H	35.0	0	0	1316.7	NNUUUUU
I 2	JUNEAU SWEETHEART CR	133 30.6	IS	18000	7000	30660	42.945	
SOUTHEAST	UNDEVELOPED	3	45.0	1178.8	7000	30660		UNNUUUUUU
	SUMDUM D-5							
AK7NPA0089	YEHRING CREEK	58 27.0	H	100.0	0	0	1985.8	NNUUUUU
I 5	JUNEAU YEHRING CREEK	133 45.9	IS	20000	5000	26000	76.378	
SOUTHEAST	UNDEVELOPED	16	155.0	1028.9	5000	26000		UNNUYYYYY
	TAKU RIVER B-6.							
AK7NPA0103	BRADLEY LAKE	59 45.0	H	120.0	0	0	7547.5	NNYYYNY
I 2	KENAI-COOK I BRADLEY CREEK	150 51.0	PA	363000	94000	410000	18.408	
SO CENTRAL	UNDEVELOPED	86	596.0	1053.9	94000	410000		NNNUYYYYY
	SELDOVIA D-3,C-3.							
AK7NPA0106	CHAKACHAMNA LAKE	61 13.0	H	5.0	0	0	19688	YNUUUUU
I 2	KENAI-COOK I CHAKACHAMNA R	152 22.0	IS	4015000	366000	1600000	12.305	
SO CENTRAL	UNDEVELOPED	1120	3646.0	792.2	366000	1600000		UNNUUUUUU
	TYONEK A-7.							
AK7NPA0107	CHUITNA	61 4.9	H	50.0	0	0	2376.2	NNYYYUU
I 5	KENAI-COOK I CHUITNA RIVER	151 19.9	IS	0	9000	45000	52.805	
SO CENTRAL	UNDEVELOPED	66	193.0	551.4	9000	45000		UNNUUUUUU
	TYONEK A-4							
AK6NPA0108	COFFEE	61 12.0	H	120.0	0	0	8066.1	NNYYUUU
I 2	KENAI-COOK I BELUGA RIVER	151 10.0	IS	0	37000	160000	50.413	
SO CENTRAL	UNDEVELOPED	860	2486.0	108.8	37000	160000		UNNUUUUUU
	TYONEK A-4.							
AK7NPA0109	CRESCENT LAKE	60 21.9	H	5.0	0	0	3474.9	YNUUUUU
I 5	KENAI-COOK I LAKE FORK OF	152 49.9	IS	306000	6000	29000	119.82	
SO CENTRAL	UNDEVELOPED	200	627.0	516.4	6000	29000		UNNUUUUUU
	KENAI B-8.							
AK6NPA0110	FOX	59 58.4	H	320.0	0	0	15863	YNUUUUU
I 5	KENAI-COOK I FOX RIVER	150 48.0	IS	0	25000	108851	145.73	
SO CENTRAL	UNDEVELOPED	105	545.0	299.7	25000	108851		UNNUUUUUU
	SELDOVIA D-3							
AK6NPA0111	HALIBUT	59 35.1	H	175.0	0	0	1600.6	YNUUUUU
I 5	KENAI-COOK I HALIBUT	151 9.5	IS	0	12000	50631	31.614	
SO CENTRAL	UNDEVELOPED	23	130.0	584.4	12000	50631		UYNYUUUUU
	SELDOVIA C-1							

Project Listing(continued)

SITE ID / DEP CODE, ACTV INV / GEOG. AREA	PROJECT NAME / PRIMARY CO. -NAME OF STREAM / OWNER / MAP REFERENCE		LATITUDE / LONGITUDE / DR.AREA (D M.M) (D M.M) (SQ.MI)	PROJ.PURP. / STATUS / AVE. Q (CFS)	DAM HT / TOT. STOR / PWR. HD. (FT) (AC FT) (FT)	EXIST.CAP. / INC. CAP. / TOT. CAP. (KW) (KW) (KW)	EXIST.ENRG / INC.ENERGY / TOT.ENERGY (MWH) (MWH) (MWH)	ANUL. COST / ENERGY COST (1000 $) ($/MWH)	ENVIRONMENTAL IMPACT CODE / SOCIAL IMPACT CODE
AK6NPA0112	KASILOF RIVER		60 15.9	H	150.0	0	0	17724	NNUUUUU
I 5	KENAI-COOK I	KASILOF RIVER	151 10.0	IS	0	40000	193000	91.834	
SO CENTRAL	UNDEVELOPED		738	2386.0	135.8	40000	193000		UNNUUUUUU
	KENAI B-4.								
AK6NPA0113	KENAI LOWER		60 29.0	H	100.0	0	0	15109	YNUUUUU
I 5	KENAI-COOK I	KENAI RIVER	150 49.9	IS	0	55000	263000	57.450	
SO CENTRAL	UNDEVELOPED		1650	5934.0	83.9	55000	263000		UNNUUUUUU
	KENAI B-3.								
AK7NPA0114	KILLEY RIVER		60 19.9	H	230.0	0	0	13222	YNUUUUU
I 5	KENAI-COOK I	KILLEY RIVER	150 25.0	IS	0	21000	100000	132.22	
SO CENTRAL	UNDEVELOPED		160	524.0	358.0	21000	100000		UNNUUUUUU
	KENAI B-2.								
AK7NPA0115	MCNEIL RIVER		59 4.9	H	75.0	0	0	1913.3	YNUUUUU
I 5	KENAI-COOK I	MCNEIL RIVER	154 10.0	IS	0	2000	8000	239.16	
SO CENTRAL	UNDEVELOPED		102	248.0	111.8	2000	8000		UNNUUUUUU
	ILIAMNA A-4								
AK6NPA0116	MOOSE HORN		60 30.9	H	110.0	0	0	19486	YNUUUUU
I 5	KENAI-COOK I	KENAI RIVER	150 23.7	IS	0	60000	290000	67.196	
SO CENTRAL	UNDEVELOPED		1540	5520.0	94.9	60000	290000		UNNUUUUUU
	KENAI C-2.								
AK7NPA0163	PAINT RIVER		59 10.3	H	33.0	0	0	2075.5	NNUUUUU
I 5	KENAI-COOK I	PAINT RIVER	154 14.3	IS	0	6000	28000	74.125	
SO CENTRAL	UNDEVELOPED		250	511.0	115.0	6000	28000		UNNUUUUUU
	ILIAMNA A-4								
AK6NPA0117	SHEEP CREEK 1		59 46.9	H	400.0	0	0	26751	YNUUUUU
I 5	KENAI-COOK I	SHEEP CREEK	150 45.9	IS	0	20000	94000	284.59	
SO CENTRAL	UNDEVELOPED		101	635.0	381.6	20000	94000		UNNUUUUUU
	SELDOVIA D-2.								
AK6NPA0119	STELTER		60 28.0	H	210.0	0	0	12292	YNUUUUU
I 6	KENAI-COOK I	KENAI RIVER	150 7.9	IS	0	84000	403000	30.502	
SO CENTRAL	UNDEVELOPED		849	3700.0	198.8	84000	403000		UYYUUUUUU
	KENAI B-1.								
AK7NPA0120	TUSTUMENA		60 2.4	H	5.0	0	0	2760.0	YNUUUUU
I 6	KENAI-COOK I	TUSTUMENA GLA	150 33.9	IS	0	21000	102000	27. 59	
SO CENTRAL	UNDEVELOPED		57	184.0	1098.9	21000	102000		UNNUUUUUU
	KENAI A-2								

Project Listing(continued)

SITE ID / DEP CODE, ACTV INV / GEOG. AREA	PROJECT NAME / PRIMARY CO. -NAME OF STREAM / OWNER / MAP REFERENCE	LATITUDE / LONGITUDE / DR.AREA (D M.M) (D M.M) (SQ.MI)	PROJ.PURP. / STATUS / AVE. Q (CFS)	DAM HT / TOT. STOR / PWR. HD. (FT) (AC FT) (FT)	EXIST.CAP. / INC. CAP. / TOT. CAP. (KW) (KW) (KW)	EXIST.ENRG / INC.ENERGY / TOT.ENERGY (MWH) (MWH) (MWH)	ANUL. COST / ENERGY COST (1000 $) ($/MWH)	ENVIRONMENTAL IMPACT CODE / SOCIAL IMPACT CODE
AKJNPA0142	BEAVER FALLS	55 24.0	H	34.0	4200	25500	215.25	NNUUUUU
I 5	KETCHIKAN BEAVER FALLS	131 30.0	OP	2000	1000	0	0	
SOUTHEAST	KETCHIKAN CITY	6	-80.2	809.0	5200	4360		UNNUUUUUU
	KETCHIKAN B-5							
AK7NPA0249	FISH CREEK	55 58.4	H	60.0	0	0	1116.1	YNUUUUU
I 5	KETCHIKAN FISH CREEK	130 3.3	IS	0	2364	19873	56.161	
SOUTHEAST	UNDEVELOPED	34	419.0	294.7	2364	19873		UYUUUUUNU
	KETCHIKAN D-1.							
AK7NPA0135	GOKACHIN	55 23.1	H	31.0	0	0	1736.3	NNUUUUU
I 5	KETCHIKAN GOKACHIN RIVE	131 19.5	IS	0	6500	28561	60.794	
SOUTHEAST	UNDEVELOPED	9	88.0	369.6	6500	28561		UNNUYYYYY
	KETCHIKAN B-4.							
AK7NPA0136	HASSLER LAKE	55 11.0	H	30.0	0	0	881.74	NNUUUUU
I 5	KETCHIKAN HASSLER CREEK	131 26.9	IS	0	2000	8700	101.35	
SOUTHEAST	UNDEVELOPED	5	-33.5	394.6	2000	8700		UNNUUUUUU
	KETCHIKAN A-5.							
AK7NPA0094	JANUARY	55 34.9	H	10.0	0	0	631.95	YNUUUUU
I 5	KETCHIKAN NF MANZANITA	131 4.9	IS	0	2000	8621	73.303	
SOUTHEAST	UNDEVELOPED	3	35.0	369.6	2000	8621		UNNUUUUUU
	KETCHIKAN C-4.							
AKINPA0138	KETCHIKAN LAKES	55 21.5	SH	33.0	4200	14800	226.64	NNUUUUU
I 2	KETCHIKAN KETCHIKAN CRE	131 37.0	OP	9200	2000	15000	15.109	
SOUTHEAST	CITY OF KETCHIKAN	11	-146.6	264.7	6200	29800		UNNUUUUUU
	KETCHIKAN B-5							
AKDNPA0141	LAKE CONNELL DAM	55 26.0	SO	85.0	0	0	590.24	NNUUUUU
I 2	KETCHIKAN WARD CREEK	131 40.2	OP	0	2000	10456	56.450	
SOUTHEAST	KETCHIKAN PULP COMPANY	13	174.0	149.8	2000	10456		UNNUUUUUU
	KETCHIAKAN B-5,B-6							
AK7NPA0121	LAKE GRACE	55 38.0	H	85.0	0	0	3827.8	YNUUUUU
I 6	KETCHIKAN GRACE CR REVI	131 0.0	IS	126000	20000	99000	38.665	
SOUTHEAST	UNDEVELOPED	29	388.0	455.5	20000	99000		UNNUUUUNU
	KETCHIKAN C-3.							
AK6NPA0122	MAHONEY LAKE LOWER	55 25.0	H	20.0	0	0	851.83	NNNYYNN
I 5	KETCHIKAN MAHONEY CREEK	131 30.0	IS	3890	1300	5900	144.37	
SOUTHEAST	UNDEVELOPED	5	104.0	84.9	1300	5900		UYYYYNUYY
	KETCHIKAN B-5							

Project Listing(continued)

SITE ID DEP CODE / ACTV INV GEOG. AREA	PROJECT NAME PRIMARY CO. -NAME OF STREAM OWNER MAP REFERENCE	LATITUDE (D M.M) LONGITUDE (D M.M) DR.AREA (SQ.MI)	PROJ.PURP. STATUS AVE. Q (CFS)	DAM HT (FT) TOT. STOR (AC FT) PWR. HD. (FT)	EXIST.CAP. (KW) INC. CAP. (KW) TOT. CAP. (KW)	EXIST.ENRG (MWH) INC.ENERGY (MWH) TOT.ENERGY (MWH)	ANUL. COST (1000 $) ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE SOCIAL IMPACT CODE
AK7NPA0123 I 2 SOUTHEAST	MAHONEY LAKE UPPER KETCHIKAN MAHONEY LAKE UNDEVELOPED KETCHIKAN B-5	55 25.0 131 31.1 2	H IS 48.0	25.0 10200 1825.1	0 14400 14400	0 55590 55590	1691.4 30.426	NNYNYNN YNNNYNUYY
AK7NPA0312 I 5 SOUTHEAST	MANZANITA LAKE KETCHIKAN MANZANITA CRE UNDEVELOPED KETCHIKAN C-4	55 34.7 131 1.2 25	 IS 856.0	70.0 100000 268.7	0 26000 26000	0 124000 124000	4197.8 33.853	
AK6NPA0125 I 5 SOUTHEAST	MIRROR KETCHIKAN MIRROR LAKE UNDEVELOPED KETCHIKAN C-4	55 29.0 131 7.9 23	H IS 303.0	116.0 0 89.9	0 4000 4000	0 18000 18000	2414.0 134.11	YNUUUUU UNNUUUUUU
AK7NPA0126 I 5 SOUTHEAST	NADZAHEEN LAKE KETCHIKAN NADZAHEEN LAK UNDEVELOPED KETCHIKAN A-5	55 13.4 131 27.9 6	H IS 60.0	40.0 0 189.8	0 1500 1500	0 6324 6324	892.61 141.14	NNUUUUU UNNUYYYYY
AK7NPA0127 I 6 SOUTHEAST	NAHA RIVER KETCHIKAN NAHA RIVER UNDEVELOPED KETCHIKAN C-5	55 35.3 131 37.9 55	H IS -195.5	50.0 0 205.0	0 6000 6000	0 26000 26000	1685.0 64.809	NNYYYUU UYYUUUUYU
AK7NPA0128 I 5 SOUTHEAST	ORCHARD CREEK KETCHIKAN ORCHARD CREEK UNDEVELOPED KETCHIKAN D-5	56 49.9 131 29.0 60	H IS 580.0	60.0 0 169.8	0 9000 9000	0 44000 44000	2691.6 61.173	NNUUUUU UNNUUUUUU
AK7NPA0129 I 5 SOUTHEAST	PERSEVERANCE LAKE KETCHIKAN WARD COVE CRE UNDEVELOPED KETCHIKAN B-6	55 24.0 131 40.0 3	H IS 37.4	35.0 8500 539.4	0 3000 3000	0 13350 13350	824.30 61.745	NNUUUUU UNNUYYYYY
AK7NPA0132 I 2 SOUTHEAST	SWAN LAKE KETCHIKAN FALLS CR REVI UNDEVELOPED KETCHIKAN C-3.	55 35.9 131 21.0 36	H IS 464.0	195.0 179000 274.7	0 22000 22000	0 85000 85000	4958.7 58.338	NNYYNUU YNNNYUUYY
AKDNPA0139 D 2 SOUTHEAST	UPPER SILVIS LAKE KETCHIKAN BEAVER FALLS CITY OF KETCHIKAN KETCHIKAN B-5	55 22.8 131 30.9 22	H OP -574.9	60.0 0 265.0	2100 2000 4100	5000 49111 54111	286.20 5.8277	NNUUUUU UNNUUUUUU

SITE ID	PROJECT NAME	LATITUDE	PROJ.PURP.	DAM HT	EXIST.CAP.	EXIST.ENRG	ANUL. COST	ENVIRONMENTAL
	PRIMARY CO. -NAME OF STREAM	LONGITUDE	STATUS	TOT. STOR	INC. CAP.	INC.ENERGY	ENERGY COST	IMPACT CODE
DEP ACTV	OWNER	DR.AREA	AVE. Q	PWR. HD.	TOT. CAP.	TOT.ENERGY		
CODE INV	MAP REFERENCE	(D M.M)		(FT)	(KW)	(MWH)	(1000 $)	
		(D M.M)		(AC FT)	(KW)	(MWH)	($/MWH)	SOCIAL
GEOG. AREA		(SQ.MI)	(CFS)	(FT)	(KW)	(MWH)		IMPACT CODE
AKCNPA2600	WHITMAN LAKE DAM	55 17.9	O	35.0	0	0	324.47	NNUUUUU
I 6	KETCHIKAN WHITMAN CREEK	131 31.7	IS	0	3000	3000	108.15	
SOUTHEAST	CITY OF KETCHIKAN	5	90.0	329.6	3000	3000		UNNUUUUUU
	KETCHIKAN B-5							
AK7NPA0134	WHITMAN LAKE	55 20.1	H	90.0	0	0	877.78	NNUUUUU
I 5	KETCHIKAN CASE CREEK	131 32.3	IS	0	2500	11586	75.762	
SOUTHEAST	UNDEVELOPED	5	-45.8	379.6	2500	11586		UNNUUUUUU
	KETCHIKAN B-5.							
AK6NPA0145	AGASHASHOK (IGICHUK)	67 13.0	H	150.0	0	0	23960	YNUUUUU
I 6	KOBUK NOATAK RIVER	162 30.0	IS	7500000	186000	820000	29.220	
NORTHWEST	UNDEVELOPED	12700	10360.0	125.8	186000	820000		UNNUUUUNU
	NORTAK,A-1,A-2,B-2,B-3							
AK6NPA0146	BUCKLAND RIVER	65 3.5	H	120.0	0	0	13624	NNUUUUU
I 6	KOBUK BUCKLAND RIVE	161 3.0	IS	0	16000	79000	172.46	
NORTHWEST	UNDEVELOPED	2410	3326.0	102.8	16000	79000		UNNUUUUUU
	CANDLE D-5.							
AK6NPA0147	FISH RIVER	65 56.9	H	120.0	0	0	10116	NNYYUUY
I 5	KOBUK FISH RIVER	160 30.0	IS	1000000	13000	60000	168.61	
NORTHWEST	UNDEVELOPED	1120	994.0	102.8	13000	60000		UNNUUUUYU
	SOLOMON D-3.							
AK6NPA0151	KIWALIK	65 53.5	H	220.0	0	0	10605	NNUUUUU
I 5	KOBUK KIWALIK RIVER	161 53.4	IS	6400000	14000	60000	176.75	
NORTHWEST	UNDEVELOPED	761	457.0	209.7	14000	60000		UNNUUUUUU
	CANDLE D-6.							
AK6NPA0149	KOBUK RIVER	67 7.9	H	125.0	0	0	28573	YNUUUUU
I 6	KOBUK KOBUK RIVER	159 7.0	IS	0	120000	526000	54.321	
NORTHWEST	UNDEVELOPED	7840	7873.0	113.8	120000	526000		UNNUUUUNU
	BAIRD MT. A-1.							
AK6NPA0150	KOGOLUKTUK RIVER	66 58.9	H	85.0	0	0	2806.1	NNUUUUU
I 5	KOBUK KOGOLUKTUK RI	156 37.9	IS	178500	8000	37000	75.840	
NORTHWEST	UNDEVELOPED	412	484.0	84.9	8000	37000		UNNUYYYYY
	SHUNGNAK D-2.							
AK6NPA0152	KUGRUK	65 54.0	H	230.0	0	0	12197	NYUUUUY
I 5	KOBUK KUGRUK RIVER	162 42.9	IS	30400	16000	73000	167. 9	
NORTHWEST	UNDEVELOPED	855	492.0	224.7	16000	73000		UYYUUUUUU
	BENDELBEN D-2							

Project Listing(continued)

SITE ID / DEP CODE ACTV INV / GEOG. AREA	PROJECT NAME / PRIMARY CO. / OWNER / MAP REFERENCE	NAME OF STREAM	LATITUDE (D M.M) / LONGITUDE (D M.M) / DR.AREA (SQ.MI)	PROJ.PURP. / STATUS / AVE. Q (CFS)	DAM HT (FT) / TOT. STOR (AC FT) / PWR. HD. (FT)	EXIST.CAP. (KW) / INC. CAP. (KW) / TOT. CAP. (KW)	EXIST.ENRG (MWH) / INC.ENERGY (MWH) / TOT.ENERGY (MWH)	ANUL. COST (1000 $) / ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE / SOCIAL IMPACT CODE
AK6NPA0153	MISHEGUK		67 56.9	H	205.0	0	0	27142	YNUUUUU
I 6	KOBUK	NOATAK RIVER	161 38.9	IS	0	174000	760000	35.713	
NORTHWEST	UNDEVELOPED		8750	7735.0	198.6	174000	760000		UNNUUUUNU
	BAIRD MT D-6.								
AK6NPA0154	NIMIUKTUK		67 58.0	H	245.0	0	0	24617	YNUUUUU
I 6	KOBUK	NOATAK RIVER	160 15.0	IS	0	140000	613000	40.158	
NORTHWEST	UNDEVELOPED		7000	6216.0	165.8	140000	613000		UNNUUUUNU
	BAIRD MT. D-3.								
AK6NPA0156	UPPER KOBUK RIVER		66 46.9	H	90.0	0	0	8801.6	NYUUUUU
I 5	KOBUK	KOBUK RIVER	156 11.0	IS	0	23000	114000	77.207	
NORTHWEST	UNDEVELOPED		2970	3036.0	61.9	23000	114000		UNNUUUUUU
	SHUNGNAK D-1.								
AK6NPA0157	UPPER NORTAK		67 56.9	H	330.0	0	0	30114	YNUUUUU
I 6	KOBUK	NOATAK RIVER	160 11.9	IS	0	211000	926471	32.504	
NORTHWEST	UNDEVELOPED		7050	4970.0	279.7	211000	926471		UNNUUUUNU
	BAIRD MTNS D-3								
AK7NPA0159	AYAKULIK		57 13.1	H	85.0	0	0	6163.8	YNUUUUU
I 5	KODIAK	AYAKULIK RIVE	154 23.9	IS	0	10000	49000	125.79	
SO CENTRAL	UNDEVELOPED		181	455.0	180.8	10000	49000		UNNUUUUNU
	KARLUK A-2.								
AKNNPA0171	DRY SPRUCE		57 55.4	H	0	75	328	33.565	YNUUUUU
I 5	KODIAK	DRY SPRUCE BA	153 3.0	OP	0	295	940	35.708	
SO CENTRAL	CWC FISHERIES		1	4.0	600.0	370	1268		UNNUUUUUU
	KODIAK D-4								
AK7NPA0160	FRASER LAKE		57 11.2	H	5.0	0	0	2370.3	YNUUUUU
I 5	KODIAK	DOG SALMON CR	154 10.1	IS	0	7000	32000	74. 73	
SO CENTRAL	UNDEVELOPED		72	179.0	301.6	7000	32000		UNNUUUUUU
	KARLUK A-1								
AK6NPA0161	KARLUK LAKE		57 23.0	H	200.0	0	0	5399.0	YNUUUUU
I 6	KODIAK	KARLUK RIVER	154 3.0	IS	0	18000	85000	63.518	
SO CENTRAL	UNDEVELOPED		165	414.0	343.6	18000	85000		UNNUNNUUU
	KARLUK C-1								
AK7NPA0162	OLGA BAY		57 3.9	H	45.0	0	0	3418.5	YNUUUUU
I 5	KODIAK	OLGA NARROWS	154 3.9	IS	0	8000	37000	92.392	
SO CENTRAL	UNDEVELOPED		335	980.0	63.9	8000	37000		UNNUUUUUU
	KARLUK A-1								

Project Listing(continued)

SITE ID / DEP CODE ACTV INV / GEOG. AREA	PROJECT NAME / PRIMARY CO. / OWNER / MAP REFERENCE	-NAME OF STREAM	LATITUDE (D M.M) / LONGITUDE (D M.M) / DR.AREA (SQ.MI)	PROJ.PURP. / STATUS / AVE. Q (CFS)	DAM HT (FT) / TOT. STOR (AC FT) / PWR. HD. (FT)	EXIST.CAP. / INC. CAP. / TOT. CAP. (KW)	EXIST.ENRG / INC.ENERGY / TOT.ENERGY (MWH)	ANUL. COST (1000 $) / ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE / SOCIAL IMPACT CODE
AKNNPA0170	ONE MILE CREEK		57 2.5	H	10.0	8	70000	0	NNUUUUU
I 9	KODIAK	ONE MILE CR K	152 23.9	OP	0	0	0	0	
SO CENTRAL	NEW ENGLAND FISH CO.		15	62.0	300.0	8	70000		UNNUUUUUU
	KODIAK D-1								
AK6NPA0164	SPIRIDON LAKE		57 40.0	H	20.0	0	0	1910.2	YNUUUUU
I 5	KODIAK	SPIRIDON LAKE	153 40.0	IS	0	6000	24806	77. 6	
SO CENTRAL	UNDEVELOPED		22	81.0	459.5	6000	24806		UNNUUUUUU
	KODIAK C-5.								
AK7NPA0165	SPIRIDON RIVER		57 40.9	H	50.0	0	0	3486.3	YNUUUUU
I 5	KODIAK	SPIRIDON RIVE	153 38.9	IS	0	25000	107853	32.325	
SO CENTRAL	UNDEVELOPED		23	600.0	269.7	25000	107853		UNNUUUUUU
	KODIAK D-6								
AK7NPA0166	TERROR LAKE		57 40.0	H	70.0	0	0	2772.1	YNNYYNN
I 2	KODIAK	TERROR RIVER	153 6.0	IS	0	20000	139000	19.943	
SO CENTRAL	UNDEVELOPED		17	99.0	1148.8	20000	139000		YNNYYNUYY
	KODIAK C-4.								
AKNNPA0169	UGANIK		57 45.9	H	5.0	30	80000	0	NNUUUUU
I 4	KODIAK	CRATER CR KOD	153 33.0	OP	0	0	0	0	
SO CENTRAL	INTERCOASTAL PKG. CO.		15	32.0	162.0	30	80000		UNNUUUUUU
	KODIAK C-4								
AK7NPA0167	UGANIK		57 41.0	H	25.0	0	0	5995.9	YNUUUUU
I 6	KODIAK	UGANIK RIVER	153 23.1	IS	0	26000	116510	51.462	
SO CENTRAL	UNDEVELOPED		97	653.0	89.9	26000	116510		UNNUUUUUU
	KODIAK C-5.								
AK6NPA0172	CROOKED CREEK		61 49.9	H	355.0	0	0	87929	NNUUUUU
I 6	KUSKOKWIM	KUSKOKWIM RIV	158 0.0	IS	0	2140000	9400000	9.3542	
SOUTHWEST	UNDEVELOPED		31100	44753.0	351.6	2140000	9400000		UNNUUUUUU
	SLEETMUTE D-6.								
AK6NPA2613	HOLY CROSS		62 15.0	H	120.0	0	0	954361	NNYYYUY
D 6	KUSKOKWIM	YUKON RIVER	159 40.0	IS	0	2800000	12300000	77.590	
YUKON	UNDEVELOPED		320000	79562.0	93.9	2800000	12300000		UYYUNNNYY
	HOLY CROSS A-1,A-2.								
AK7NPA0173	KUSKOKWIM RIVER		62 4.9	H	75.0	0	0	4760.0	NNUUUUU
I 5	KUSKOKWIM	KOSKOKWIM RIV	153 19.9	IS	0	15000	72000	66.112	
SOUTHWEST	UNDEVELOPED		870	159.0	173.8	15000	72000		UNNUUUUUU
	MCGRATH A-1.								

Project Listing(continued)

SITE ID / DEP CODE, ACTV INV / GEOG. AREA	PROJECT NAME / PRIMARY CO. / OWNER / MAP REFERENCE	NAME OF STREAM	LATITUDE (D M.M) / LONGITUDE (D M.M) / DR.AREA (SQ.MI)	PROJ.PURP. / STATUS / AVE. Q (CFS)	DAM HT (FT) / TOT. STOR (AC FT) / PWR. HD. (FT)	EXIST.CAP. / INC. CAP. / TOT. CAP. (KW)	EXIST.ENRG / INC.ENERGY / TOT.ENERGY (MWH)	ANUL. COST (1000 $) / ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE / SOCIAL IMPACT CODE
AK6NPA0174	BELUGA LOWER		61 15.0	H	60.0	0	0	4256.8	NNUYUUU
I 5	MATANUSKA-SU	BELUGA RIVER	151 0.0	IS	0	15000	72000	59.122	
SO CENTRAL	UNDEVELOPED		950	2470.0	48.9	15000	72000		UNNUUUUUU
	TYONEK A-3.								
AK6NPA0175	BELUGA UPPER		61 15.9	H	180.0	0	0	11143	NNUYUUU
D 2	MATANUSKA-SU	BELUGA RIVER	151 15.0	IS	0	48000	210000	53. 66	
SO CENTRAL	UNDEVELOPED		840	2484.0	141.8	48000	210000		UNNUUUUUU
	TYONEK B-4.								
AK7NPA0148	BOULDER CREEK		63 17.2	H	91.0	0	0	2853.4	
I 5	MATANUSKA-SU	BOULDER CREEK	147 9.9	IS	91865	7000	35000	81.528	
SO CENTRAL	UNDEVELOPED		42	92.5	917.0	7000	35000		
	HEALY B-1								
AK7NPA0176	BOULDER CREEK 1		61 40.0	H	200.0	0	0	5191.4	NNUUUUU
I 5	MATANUSKA-SU	BOULDER CREEK	149 4.9	IS	0	14000	69000	75.239	
SO CENTRAL	UNDEVELOPED		90	113.0	1315.6	14000	69000		UNNUUUUUU
	ANCHORAGE D-4.								
AK6NPA0177	CACHE		62 33.9	H	340.0	0	0	8969.2	NNUUUUU
I 5	MATANUSKA-SU	TALKEETNA RIV	149 11.0	IS	780000	66000	289600	30.971	
SO CENTRAL	UNDEVELOPED		750	1450.0	299.7	66000	289600		UNNUUUUUU
	TALKEETNA MTNS C-5.								
AK6NPA0178	CARIBOU CREEK		61 46.9	H	620.0	0	0	15895	NNYYYUU
I 5	MATANUSKA-SU	CARIBOU CREEK	147 34.9	IS	0	19000	90000	176.61	
SO CENTRAL	UNDEVELOPED		260	304.0	526.4	19000	90000		UNNUUUUUU
	ANCHORAGE D-2.								
AK6NPA0182	CHULITNA EF		63 10.0	H	420.0	0	0	6701.7	NNYYYUU
I 5	MATANUSKA-SU	E FORK CHULIT	149 25.0	IS	0	12000	59000	113.58	
SO CENTRAL	UNDEVELOPED		135	331.0	379.6	12000	59000		UNNUUUUUU
	HEALY A-5.								
AK6NPA0181	CHULITNA JURRICANE		63 4.9	H	230.0	0	0	7482.3	NNUUUUU
I 2	MATANUSKA-SU	CHULITNA RIVE	149 45.0	IS	0	34000	166000	45. 74	
SO CENTRAL	UNDEVELOPED		795	2622.0	206.7	34000	166000		UNYUUUUUU
	HEALY A-6.								
AK6NPA0179	CHULITNA WF		63 6.9	H	300.0	0	0	5460.4	NNUUUUU
I 5	MATANUSKA-SU	W FORK CHULIT	149 35.2	IS	0	14000	68000	80.300	
SO CENTRAL	UNDEVELOPED		355	883.0	286.7	14000	68000		UYYUUUUUU
	HEALY A-6.								

Project Listing(continued)

SITE ID / DEP ACTV / CODE INV / GEOG. AREA	PROJECT NAME / PRIMARY CO. -NAME OF STREAM / OWNER / MAP REFERENCE	LATITUDE (D M.M) / LONGITUDE (D M.M) / DR.AREA (SQ.MI)	PROJ.PURP. / STATUS / AVE. Q (CFS)	DAM HT (FT) / TOT. STOR (AC FT) / PWR. HD. (FT)	EXIST.CAP. (KW) / INC. CAP. (KW) / TOT. CAP. (KW)	EXIST.ENRG (MWH) / INC.ENERGY (MWH) / TOT.ENERGY (MWH)	ANUL. COST (1000 $) / ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE / SOCIAL IMPACT CODE
AK7NPA0180	CHUNILNA	62 49.9	H	175.0	0	0	2491.4	NNUUUUU
I 5	MATANUSKA-SU CHUNILNA CREE	150 0.0	IS	0	5000	25000	99.656	
SO CENTRAL	UNDEVELOPED	240	524.0	197.8	5000	25000		UNNUUUUUU
	TALKEETNA B-1.							
AK6NPA0183	COAL	62 57.3	H	265.0	0	0	9336.3	NNUUUUU
E 5	MATANUSKA-SU CHULITNA RIVE	149 43.5	IS	0	40000	193000	48.374	
SO CENTRAL	UNDEVELOPED	985	3312.0	240.7	40000	193000		UNNUNNUUU
	TALKEETNA MTNS D-6.							
AK6NPA0184	COAL CREEK	61 46.9	H	410.0	0	0	42306	NNYYYUU
I 5	MATANUSKA-SU MATANUSKA RIV	148 10.0	IS	0	64000	307000	137.80	
SO CENTRAL	UNDEVELOPED	1128	2208.0	290.7	64000	307000		UNNUUUNUU
	ANCHORAGE D-4.							
AK4NPA0056	COOK INLET TIDAL	61 9.6	H	75.0	0	0	0	NNUUUUU
I 4	MATANUSKA-SU COOK INLET	150 9.5	IS	0	0	0	0	
SO CENTRAL	UNDEVELOPED		0	12.0	0	0		UNNUUUUNU
	ANCHORAGE A-8.							
AK7NPA0187	DEADMAN CREEK	62 55.8	H	110.0	0	0	7822.2	NNUYUUU
I 5	MATANUSKA-SU DEADMAN CREEK	148 22.8	IS	0	34000	165000	47.407	
SO CENTRAL	UNDEVELOPED	160	483.0	961.0	34000	165000		UNNUUUUYU
	TALKEETNA MTNS D-3.							
AK6NPA0185	DENALI USBR PROPOSAL	62 42.	H	268.0	0	0	19680	NNUUUUU
E 5	MATANUSKA-SU SUSITNA RIVER	147 34.	SI	4400000	92522	396059	49.691	
SO CENTRAL	UNDEVELOPED	1260	3191.0	397.5	92522	396059		UYNUUUUUU
	TALKEETNA MTNS C-2							
AK6NPA0186	DEVIL CANYON USBR PROPOSAL	62 48.9	H	635.0	0	0	31540	NNUUUUU
E 6	MATANUSKA-SU SUSITNA RIVER	149 18.9	SI	970000	738000	3205000	9.8409	
SO CENTRAL	UNDEVELOPED	5810	9510.0	574.4	738000	3205000		UYNUUUUUU
	TALKEETNA MTNS D-5							
AK6NPA0188	DEVIL CANYON NPA PROPOSAL	62 48.9	HRC	635.0	0	0	39324	NYNNNUN
D 2	MATANUSKA-SU SUSITNA RIVER	149 18.9	FP	1050000	776000	3410000	11.532	
SO CENTRAL	UNDEVELOPED	5810	9227.0	574.4	776000	3410000		UNNNYNUYY
	TALKEETNA MTS D-5 D-4.							
AKJNPA0225	EKLUTNA DAM	61 24.6	H	20.0	30000	164000	0	NNUUUUU
I 4	MATANUSKA-SU EKLUTNA RIVER	149 9.4	OP	213271	0	0	0	
SO CENTRAL	DOI USBR	119	187.8	851.0	30000	164000		UNNUUUUUU
	ANCHORAGE C-5							

Project Listing(continued)

SITE ID DEP ACTV CODE INV GEOG. AREA	PROJECT NAME PRIMARY CO. -NAME OF STREAM OWNER MAP REFERENCE	LATITUDE LONGITUDE DR.AREA (D M.M) (D M.M) (SQ.MI)	PROJ.PURP. STATUS AVE. Q (CFS)	DAM HT TOT. STOR PWR. HD. (FT) (AC FT) (FT)	EXIST.CAP. INC. CAP. TOT. CAP. (KW) (KW) (KW)	EXIST.ENRG INC.ENERGY TOT.ENERGY (MWH) (MWH) (MWH)	ANUL. COST ENERGY COST (1000 $) ($/MWH)	ENVIRONMENTAL IMPACT CODE SOCIAL IMPACT CODE
AK7NPA0189	EMERALD	61 45.3	H	285.0	0	0	10533	NNUUUUU
I 5	MATANUSKA-SU SKWENTNA RIVE	152 43.9	IS	0	37000	177000	59.509	
SO CENTRAL	UNDEVELOPED	370	1090.0	365.6	37000	177000		UNNUUUUUU
	TYONEK D-8							
AK6NPA0190	GOLD	62 44.0	H	230.0	0	0	25199	NNYYUUU
D 6	MATANUSKA-SU SUSITNA RIVER	149 41.9	IS	0	260000	1139000	22.124	
SO CENTRAL	UNDEVELOPED	6160	10121.0	188.8	260000	1139000		UYYUUUUUU
	TALKEETNA MTS C-6 D-6 D-5.							
AK7NPA0191	GRANITE GORGE	62 27.0	H	200.0	0	0	5443.0	NNYYYUU
I 6	MATANUSKA-SU TALKEETNA RIV	149 26.9	IS	0	72000	345000	15.776	
SO CENTRAL	UNDEVELOPED	865	1600.0	415.5	72000	345000		UNNUUUUUU
	TALKEETNA MTNS B5.							
AK7NPA0192	GREENSTONE	62 31.9	H	160.0	0	0	6733.3	NNUUUUU
I 6	MATANUSKA-SU TALKEETNA	149 2.0	IS	0	51000	246000	27.371	
SO CENTRAL	UNDEVELOPED	790	1587.0	303.6	51000	246000		UNNUUUUUU
	TALKEETNA MTNS C-5.							
AK6NPA0193	HAYES	61 58.0	H	210.0	0	0	15981	NNUUUUU
I 5	MATANUSKA-SU SKWENTNA RIVE	151 51.0	IS	0	89000	429000	37.253	
SO CENTRAL	UNDEVELOPED	1730	4830.0	106.8	89000	429000		UNNUUUUUU
	TYONEK D-5.							
AK6NPA0194	HICKS SITE	61 47.9	H	300.0	0	0	13779	NNUYUUU
I 5	MATANUSKA-SU MATANUSKA RIV	147 48.0	IS	0	59000	286000	48.179	
SO CENTRAL	UNDEVELOPED	950	1794.0	280.7	59000	286000		UNYUUUUUU
	ANCHORAGE D-3							
AK6NPA0195	IRON CREEK	62 21.3	H	350.0	0	0	11254	NNUUUUU
I 5	MATANUSKA-SU IRON CREEK	149 16.2	IS	0	31000	147000	76.559	
SO CENTRAL	UNDEVELOPED	210	552.0	199.8	31000	147000		UNNUUUUUU
	TALKEETNA MTNS B-5.							
AK6NPA0196	KASHWITNA	61 57.2	H	240.0	0	0	17396	NNYYYUU
I 5	MATANUSKA-SU KASHWITNA RIV	149 56.0	IS	0	20000	89178	195. 7	
SO CENTRAL	UNDEVELOPED	270	570.0	234.7	20000	89178		UNNUUUNUU
	ANCHORAGE D-8							
AK6NPA0197	KEETNA	62 26.5	H	360.0	0	0	9843.7	NNUUUUU
I 2	MATANUSKA-SU TALKEETNA RIV	149 41.6	IS	910000	74000	324000	30.382	
SO CENTRAL	UNDEVELOPED	1250	2400.0	285.7	74000	324000		UNNUUUUUU
	TALKEETNA MTS B-6							

Project Listing(continued)

SITE ID / DEP CODE ACTV INV / GEOG. AREA	PROJECT NAME / PRIMARY CO. -NAME OF STREAM / OWNER / MAP REFERENCE	LATITUDE (D M.M) / LONGITUDE (D M.M) / DR.AREA (SQ.MI)	PROJ.PURP. / STATUS / AVE. Q (CFS)	DAM HT (FT) / TOT. STOR (AC FT) / PWR. HD. (FT)	EXIST.CAP. (KW) / INC. CAP. (KW) / TOT. CAP. (KW)	EXIST.ENRG (MWH) / INC.ENERGY (MWH) / TOT.ENERGY (MWH)	ANUL. COST (1000 $) / ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE / SOCIAL IMPACT CODE
AK6NPA0198	KING MTN	61 15.0	H	300.0	0	0	14681	NNYYYUU
I 6	MATANUSKA-SU MATNAUSKA RIV	148 19.9	IS	0	44000	210000	69.913	
SO CENTRAL	UNDEVELOPED	1635	3174.0	275.7	44000	210000		UYYUUUUUU
	ANCHORAGE D-5.							
AK6NPA0199	LAKE CREEK LOWER	62 6.9	H	250.0	0	0	5496.8	NNUUUUU
I 5	MATANUSKA-SU LAKE CREEK	151 0.0	IS	0	22000	105000	52.350	
SO CENTRAL	UNDEVELOPED	335	980.0	304.6	22000	105000		UNNUUUUUU
	TALKEETNA A-2.							
AK7NPA0200	LAKE CREEK UPPER	62 26.0	H	125.0	0	0	4378.1	NNYYUUY
I 5	MATANUSKA-SU LAKE CREEK	151 27.9	IS	0	15000	74000	59.164	
SO CENTRAL	UNDEVELOPED	85	248.0	559.4	15000	74000		UYNUNUUUU
	TALKEETNA B-3.							
AK6NPA0201	LANE	62 32.9	H	190.0	0	0	19890	NNUYUUU
D 6	MATANUSKA-SU SUSITNA RIVER	150 4.9	IS	0	240000	1052000	18.907	
SO CENTRAL	UNDEVELOPED	6280	10360.0	168.8	240000	1052000		UNNUUUUUU
	TALKEETNA C-1 TALKEETNA MTS							
AK6NPA0202	LOWER CHULITNA	62 33.9	H	200.0	0	0	17837	NNUYUUU
D 6	MATANUSKA-SU CHULITNA RIVE	150 14.0	IS	0	90000	394000	45.272	
SO CENTRAL	UNDEVELOPED	2600	8771.0	88.9	90000	394000		UNNUUUUUU
	TALKEETNA B-1							
AK6NPA0203	LUCY	62 55.0	H	200.0	0	0	8102.9	NNYYUUU
I 5	MATANUSKA-SU CHULITNA RIVE	149 57.9	IS	0	15000	71000	114.12	
SO CENTRAL	UNDEVELOPED	1080	3588.0	165.8	15000	71000		UNNUUUUUU
	TALKEETNA MTNS D6.							
AK6NPA0204	MCLAREN RIVER	62 57.0	H	290.0	0	0	32562	NNUUUUU
I 5	MATANUSKA-SU MCLAREN RIVER	146 22.0	IS	0	55000	263000	123.80	
SO CENTRAL	UNDEVELOPED	485	1946.0	262.7	55000	263000		UNNUUUUUU
	GULKANA D-6.							
AK6NPA0205	MOOSE CREEK	61 45.0	H	180.0	0	0	7713.6	NNYYYUU
I 6	MATANUSKA-SU MATANUSKA RIV	148 41.9	IS	0	21000	100000	77.136	
SO CENTRAL	UNDEVELOPED	2070	4027.0	165.8	21000	100000		UNNUUUUUU
	ANCHORAGE C-6.							
AK6NPA0206	OHIO	62 57.3	H	240.0	0	0	8062.6	NNYYUUU
I 5	MATANUSKA-SU CHULITNA RIVE	149 43.5	IS	0	30000	144000	55.990	
SO CENTRAL	UNDEVELOPED	916	3064.0	223.7	30000	144000		UNNUUUUUU
	TALKEETNA MTNS D-6.							

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Project Listing(continued)

SITE ID DEP CODE / ACTV INV GEOG. AREA	PROJECT NAME PRIMARY CO. -NAME OF STREAM OWNER MAP REFERENCE	LATITUDE (D M.M) LONGITUDE (D M.M) DR.AREA (SQ.MI)	PROJ.PURP. STATUS AVE. Q (CFS)	DAM HT (FT) TOT. STOR (AC FT) PWR. HD. (FT)	EXIST.CAP. (KW) INC. CAP. (KW) TOT. CAP. (KW)	EXIST.ENRG (MWH) INC.ENERGY (MWH) TOT.ENERGY (MWH)	ANUL. COST (1000 $) ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE SOCIAL IMPACT CODE
AK7NPA0207 I 5 SO CENTRAL	PALMER MATANUSKA-SU MATANUSKA RIV UNDEVELOPED ANCHORAGE C-6.	61 32.9 149 4.9 2070	H IS 4027.0	50.0 0 165.8	0 16000 16000	0 79000 79000	7200.2 91.142	NNUYUUU UNYUUUUUU
AK6NPA0208 I 5 SO CENTRAL	PURINTON CREEK MATANUSKA-SU MATANUSKA RIV UNDEVELOPED ANCHORAGE D-4.	61 45.9 148 0.0 1082	H IS 2070.0	380.0 0 290.7	0 67000 67000	0 324000 324000	32328 99.777	NNUUUUU UNNUUUUUU
AK7NPA0209 I 6 SO CENTRAL	RUSH LAKE MATANUSKA-SU BOULDER CREEK UNDEVELOPED ANCHORAGE D-4.	61 49.9 148 15.0 89	H IS 108.0	5.0 0 891.1	0 9000 9000	0 45000 45000	1373.4 30.520	NNUUUUU UNNUUUUUU
AK6NPA0210 I 5 SO CENTRAL	SHEEP CREEK MATANUSKA-SU SHEEP CREEK UNDEVELOPED TALKEETNA MTNS B-5.	62 18.3 149 27.9 366	H IS 750.0	350.0 540000 349.6	0 37000 37000	0 330000 330000	7509.9 22.757	NNYYYUU UNNUUUUUU
AK6NPA0211 D 2 SO CENTRAL	SKWENTNA (HAYES) MATANUSKA-SU SKWENTNA RIVE UNDEVELOPED TYONEK D-6.	61 51.9 152 7.0 950	H IS 2624.0	360.0 0 290.7	0 98000 98000	0 490000 490000	14713 30. 27	NNUUUUU UNNUUUUUU
AK7NPA0212 I 5 SO CENTRAL	STRANCLINE LAKE MATANUSKA-SU BELUGA RIVER UNDEVELOPED TYONEK B-5,B-6.	61 29.0 151 58.9 54	H IS 159.0	5.0 0 851.1	0 17000 17000	0 81000 81000	2874.7 35.490	NNUUUUU UNNUUUUUU
AK6NPA0213 D 6 SO CENTRAL	TALACHULITNA MATANUSKA-SU SKWENTNA RIVE UNDEVELOPED TYONEK D-4.	61 51.9 151 22.0 2250	H IS 6216.0	130.0 0 123.8	0 75000 75000	0 1390000 1390000	10978 7.8981	NNYYYUU UNNUUUUUU
AK6NPA0214 I 5 SO CENTRAL	TALACHULITNA RIVER MATANUSKA-SU TALACHULITNA UNDEVELOPED TYONEK C-4.	61 45.9 151 27.9 360	H IS 994.0	250.0 0 230.7	0 28000 28000	0 137000 137000	13230 96.572	NNYYYUY UNNUUUUUU
AK6NPA0215 I 5 SO CENTRAL	TALKEETNA RIVER (SHEEP) MATANUSKA-SU TALKEETNA RIV UNDEVELOPED TALKEETNA MTNS B-6.	62 21.9 149 46.9 1790	H IS 6072.0	125.0 0 90.9	0 31000 31000	0 149000 149000	10988 73.749	NNUUUUU UNNUUUUUU

Project Listing(continued)

Site ID	Dep Code	Actv Inv	Geog. Area	Project Name	Primary Co.	Name of Stream	Owner	Map Reference	Latitude (D M.M)	Longitude (D M.M)	Dr. Area (SQ.MI)	Proj. Purp.	Status	Ave. Q (CFS)	Dam Ht (FT)	Tot. Stor (AC FT)	Pwr. Hd. (FT)	Exist. Cap. (KW)	Inc. Cap. (KW)	Tot. Cap. (KW)	Exist. Enrg (MWH)	Inc. Energy (MWH)	Tot. Energy (MWH)	Anul. Cost (1000 $)	Energy Cost ($/MWH)	Environmental Impact Code	Social Impact Code
AK6NPA0216	I	2	SO CENTRAL	TALKEETNA 2	MATANUSKA-SU	TALKEETNA RIV	UNDEVELOPED	TALKEETNA MTNS B-5.	62 28.0	149 22.0	850	H	IS	1650.0	375.0	0	369.6	0	90000	90000	0	406446	406446	9487.0	23.341	NNUUUUU	UNNUUUUUU
AK6NPA0218	I	6	SO CENTRAL	TOKICHITNA	MATANUSKA-SU	CHULITNA RIVE	UNDEVELOPED	TALKEETNA C-1.	62 33.9	150 11.9	2560	H	IS	8654.0	235.0	0	185.8	0	184000	184000	0	806000	806000	22281	27.644	NNYYUUY	UNNUUUUUU
AK7NPA0219	I	5	SO CENTRAL	TRAPPER	MATANUSKA-SU	TALKEETNA RIV	UNDEVELOPED	TALKEETNA MTNS C-5.	62 32.9	149 3.0	760	H	IS	1573.0	250.0	0	244.7	0	45000	45000	0	216000	216000	10160	47. 40	NNUYUUU	UNNUUUUUU
AK7NPA0220	E	6	SO CENTRAL	VEE USBR PROPOSAL	MATANUSKA-SU	SUSITNA RIVER	UNDEVELOPED	TALKEETNA MTNS C-2.	62 42.0	147 32.0	4140	H	SI	6533.0	425.0	2820000	297.5	0	646609	646609	0	1230222	1230222	31686	25.756	NNUUUUU	UYNUUUUUU
AK6NPA0222	D	2	SO CENTRAL	WATANA NPA PROPOSAL	MATANUSKA-SU	SUSITNA RIVER	UNDEVELOPED	TALKEETNA MTS D-4,3,2 C-2,1.	62 48.9	148 30.9	5180	HRC	FP	8137.0	810.0	9624000	659.3	0	792000	792000	0	3480000	3480000	62568	17.979	NYNNNUN	UNNNYNUYY
AK6NPA0221	E	6	SO CENTRAL	WATANA USBR PROPOSAL	MATANUSKA-SU	SUSITNA RIVER	UNDEVELOPED	TALKEETNA MTNS D-3	62 48.9	148 30.9	5180	H	IS	8343.0	440.0	3400000	424.5	0	478000	478000	0	7000000	7000000	33650	4.8072	NNUUUUU	UYNUUUUUU
AK6NPA0223	D	5	SO CENTRAL	WHISKERS	MATANUSKA-SU	SUSITNA RIVER	UNDEVELOPED	TALKEETNA B-1 C-1.	62 28.0	150 7.9	6320	H	IS	10360.0	140.0	0	58.9	0	84000	84000	0	368000	368000	16834	45.744	NNYYUUU	UNNUUUUUU
AK6NPA0224	D	2	SO CENTRAL	YENTNA	MATANUSKA-SU	YENTNA RIVER	UNDEVELOPED	TYONEK C-2.	61 36.9	150 32.0	6400	H	IS	17611.0	120.0	0	81.9	0	219000	219000	0	960000	960000	36940	38.479	NNYYUUY	UNNUUUUUU
AK6NPA0391	I	5	NORTHWEST	ANVIK RIVER	NOME	ANVIK RIVER	UNDEVELOPED	UNALAKLEEK B-3	62 43.0	160 26.9	2400	H	IS	130.0	125.0	0	75.0	0	1400	1400	0	59500	59500	5995.6	100.76	NNUUUUU	UNNUUYYYY

Project Listing(continued)

SITE ID / DEP CODE ACTV INV / GEOG. AREA	PROJECT NAME / PRIMARY CO. / OWNER / MAP REFERENCE	NAME OF STREAM	LATITUDE (D M.M) / LONGITUDE (D M.M) / DR.AREA (SQ.MI)	PROJ.PURP. / STATUS / AVE. Q (CFS)	DAM HT (FT) / TOT. STOR (AC FT) / PWR. HD. (FT)	EXIST.CAP. (KW) / INC. CAP. (KW) / TOT. CAP. (KW)	EXIST.ENRG (MWH) / INC.ENERGY (MWH) / TOT.ENERGY (MWH)	ANUL. COST (1000 $) / ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE / SOCIAL IMPACT CODE
AK6NPA0226	KUZITRIN RIVER		65 13.0	H	120.0	0	0	11284	NNUUUUU
I 5	NOME	KUZITRIN RIVE	166 0.9	IS	0	14000	67000	168.43	
NORTHWEST	UNDEVELOPED		1790	3138.0	94.9	14000	67000		UYYUUUUUU
	BENDELEBEN A-6.								
AK7NPA0227	SALMON LAKE		64 54.9		65.0	0	0	3007.4	NNUUUUU
I 5	NOME	KRUZGAMEPA RI	165 0.0		0	5000	24000	125.30	
NORTHWEST	UNDEVELOPED		107	368.0	154.8	5000	24000		UNNUUUUUU
	SOLOMON D-6								
AK6NPA0228	TUKSUK		65 13.8	H	190.0	0	0	14161	NNYYYUY
I 5	NOME	TUKSUK CHANEL	166 1.4	IS	7000000	66000	289000	49. 2	
NORTHWEST	UNDEVELOPED		4275	2597.0	186.8	66000	289000		UUUUUNUNU
	TELLER A-2.								
AK7NPA0244	BADGER BAY LAKE		55 13.0	H	56.0	0	0	1125.7	YNUUUUU
I 5	OUTER KETCHI	BADGER BAY LA	130 45.9	IS	0	3300	20000	56.286	
SOUTHEAST	UNDEVELOPED		8	90.0	329.6	3300	20000		UNNUUUUYU
	KETCHIKAN A-3.								
AK7NPA0245	BAKEWELL ARM		55 18.9	H	35.0	0	0	1464.4	YNUUUUU
I 5	OUTER KETCHI	BAKEWELL ARM	130 41.9	IS	0	3300	21000	69.736	
SOUTHEAST	UNDEVELOPED		20	195.0	164.8	3300	21000		UNNUUUUYU
	KETCHIKAN B-2.								
AK7NPA0246	CHECATS		55 29.0	H	40.0	0	0	1880.3	YNUUUUU
I 6	OUTER KETCHI	CHECATS LAKE	130 48.9	IS	0	8500	37410	50.263	
SOUTHEAST	UNDEVELOPED		15	80.0	699.3	8500	37410		UNNUUUUYU
	KETCHIKAN B-3.								
AKPNPA0097	CHESTER LAKE		55 7.1	H	12.0	0	0	254.55	NNUUUUU
I 2	OUTER KETCHI	NICHOLS OFFST	131 31.6	OP	0	2500	5221	48.755	
SOUTHEAST	METLAKATLA POWER & LIGHT		2	26.0	749.2	2500	5221		UNNUUUUUU
	KETCHIKAN A-5								
AK6NPA0247	CHICKAMIN RIVER		56 0.0	H	70.0	0	0	9723.9	YNUUUUU
I 6	OUTER KETCHI	CHICKAMIN RIV	130 37.3	IS	0	150000	727000	13.375	
SOUTHEAST	UNDEVELOPED		562	6624.0	227.7	150000	727000		UNNUUUUYU
	BRADFIELD CANAL A-2								
AK7NPA0248	DAVIS RIVER		55 45.3	H	300.0	0	0	5888.8	YNUUUUU
I 6	OUTER KETCHI	DAVIS RIVER	130 10.3	IS	0	28000	131000	44.953	
SOUTHEAST	UNDEVELOPED		78	920.0	366.6	28000	131000		UNNUUUUNU
	KETCHIKAN D-1.								

Project Listing(continued)

SITE ID / DEP CODE ACTV INV / GEOG. AREA	PROJECT NAME / PRIMARY CO. -NAME OF STREAM / OWNER / MAP REFERENCE	LATITUDE / LONGITUDE / DR.AREA (D M.M) (D M.M) (SQ.MI)	PROJ.PURP. / STATUS / AVE. Q (CFS)	DAM HT / TOT. STOR / PWR. HD. (FT) (AC FT) (FT)	EXIST.CAP. / INC. CAP. / TOT. CAP. (KW) (KW) (KW)	EXIST.ENRG / INC.ENERGY / TOT.ENERGY (MWH) (MWH) (MWH)	ANUL. COST / ENERGY COST (1000 $) ($/MWH)	ENVIRONMENTAL IMPACT CODE / SOCIAL IMPACT CODE
AK7NPA0229	EAGLE	56 0.0	H	5.0	0	0	1199.3	NNUUUUU
I 5	OUTER KETCHI EAGLE LAKE	131 25.0	IS	0	2000	9500	126.24	
SOUTHEAST	UNDEVELOPED	45	443.0	284.7	2000	9500		UNNUYYYYY
	BRADFIELD CANAL A-5.							
AK7NPA0250	GRANITE CREEK	55 40.0	H	60.0	0	0	1534.7	YNUUUUU
I 6	OUTER KETCHI GRANITE CREEK	130 55.0	IS	0	8000	39000	39.353	
SOUTHEAST	UNDEVELOPED	9	113.0	862.1	8000	39000		UNNUUUUNU
	KETCHIKAN C-3.							
AK6NPA0251	HIDDEN INLET LAKE	54 58.0	H	150.0	0	0	1852.4	YNUUUUU
I 5	OUTER KETCHI WATERFALLS CR	130 22.0	IS	0	5000	20000	92.624	
SOUTHEAST	UNDEVELOPED	10	105.0	299.7	5000	20000		UNNUUUUNU
	KETCHIKAN A-1.							
AK6NPA0252	HUMPBACK LAKE	55 0.9	H	25.0	0	0	2603.4	YNUUUUU
I 6	OUTER KETCHI HUMPBACK CREE	130 37.9	IS	0	14000	62000	41.990	
SOUTHEAST	UNDEVELOPED	34	310.0	299.7	14000	62000		UNNUUUUNU
	JUNEAU A-5.							
AK7NPA0230	LEDUC	55 56.0	H	15.0	0	0	1991.7	YNUUUUU
I 6	OUTER KETCHI LEDUC RIVER	130 51.0	IS	0	14000	62000	32.124	
SOUTHEAST	UNDEVELOPED	7	84.0	1241.0	14000	62000		UNNUUUUNU
	KETCHIKAN D-3.							
AK6NPA0231	MARTEN ARM LAKE	55 8.0	H	10.0	0	0	966.35	YNUUUUU
I 6	OUTER KETCHI MARTEN LAKE	130 37.0	IS	0	3500	16000	60.397	
SOUTHEAST	UNDEVELOPED	6	48.0	509.4	3500	16000		UNNUUUUUU
	KETCHIKAN A-2							
AK6NPA0233	PUNCHBOWL LAKE LOWER	55 30.9	H	21.0	0	0	1861.7	YNUUUUU
I 6	OUTER KETCHI PUNCHBOWL CRE	130 47.0	IS	0	15000	64376	28.920	
SOUTHEAST	UNDEVELOPED	12	153.0	631.3	15000	64376		UNNUUUUUU
	KETCHIKAN C-3							
AK6NPA0234	PUNCHBOWL LAKE UPPER	55 26.0	H	35.0	0	0	1135.0	YNUUUUU
I 6	OUTER KETCHI PUNCHBOWL CRE	130 44.0	IS	0	7000	31234	36.340	
SOUTHEAST	UNDEVELOPED	3	37.0	1266.7	7000	31234		UNNUUUUUU
	KETCHIKAN C-3							
AK7NPA0232	PUNCHBOWL CREEK	55 31.9	H	75.0	0	0	2930.2	YNUUUUU
I 6	OUTER KETCHI PUNCHBOWL CR	130 45.9	IS	0	15000	64000	45.785	
SOUTHEAST	UNDEVELOPED	14	174.0	621.3	15000	64000		UNNUUUUYU
	KETCHIKAN C-3,D-3.							

Project Listing(continued)

SITE ID / DEP CODE ACTV INV / GEOG. AREA	PROJECT NAME / PRIMARY CO. -NAME OF STREAM / OWNER / MAP REFERENCE	LATITUDE (D M.M) / LONGITUDE (D M.M) / DR.AREA (SQ.MI)	PROJ.PURP. / STATUS / AVE. Q (CFS)	DAM HT (FT) / TOT. STOR (AC FT) / PWR. HD. (FT)	EXIST.CAP. (KW) / INC. CAP. (KW) / TOT. CAP. (KW)	EXIST.ENRG (MWH) / INC.ENERGY (MWH) / TOT.ENERGY (MWH)	ANUL. COST (1000 $) / ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE / SOCIAL IMPACT CODE
AKINPA0253	PURPLE LAKE	55 3.9	H	24.0	3000	10400	155.34	NNUUUUU
I 5	OUTER KETCHI PURPLE LAKE	131 15.9	OP	0	1400	0	0	
SOUTHEAST	CITY OF METLAKATLA	7	70.0	320.0	4400	2770		UNNUUUUUU
	KETCHIKAN A-5							
AK7NPA0235	RED LAKE	55 8.0	H	165.0	0	0	4033.5	YNUUUUU
I 6	OUTER KETCHI RED R BOCA DE	130 30.9	IS	0	24000	104000	38.784	
SOUTHEAST	UNDEVELOPED	44	566.0	346.6	24000	104000		UNNUUUUNU
	KETCHIKAN A-2.							
AK7NPA0236	RUDYERD	55 35.9	H	5.0	0	0	2246.7	YNUUUUU
I 6	OUTER KETCHI NONAME MINOR	130 36.0	IS	0	19000	83000	27. 68	
SOUTHEAST	UNDEVELOPED	8	87.0	1673.3	19000	83000		UNNUUUUUU
	KETCHIKAN C-2.							
AK7NPA0237	SAKS COVE	55 58.0	H	125.0	0	0	5538.5	YNUUUUU
I 5	OUTER KETCHI SAKS CREEK	131 4.9	IS	0	15000	72000	76.923	
SOUTHEAST	UNDEVELOPED	22	207.0	620.3	15000	72000		UNNUUUUNU
	KETCHIKAN D-4.							
AK6NPA0238	SALMON RIVER	56 02.	H	50.0	0	0	2195.4	NNUUUUU
I 5	OUTER KETCHI SALMON RIVER	130 10.0	IS	0	8000	34600	63.451	
SOUTHEAST	UNDEVELOPED	65	-866.3	59.9	8000	34600		UNNUYYYNY
	BRADFIELD CANAL A-1.							
AK6NPA0239	SHELOKUM	55 58.0	H	40.0	0	0	2002.4	NNUUUUU
I 6	OUTER KETCHI SHELOKUM CREE	131 37.9	IS	87000	10000	50331	39.785	
SOUTHEAST	UNDEVELOPED	17	216.0	349.6	10000	50331		UNNUYYYNY
	KETCHIKAN D-5.							
AK7NPA0240	SHORT CREEK	56 0.0	H	45.0	0	0	2251.2	NNUUUUU
I 6	OUTER KETCHI REFLECTION LA	131 30.9	IS	86000	10000	46739	48.165	
SOUTHEAST	UNDEVELOPED	19	216.0	324.6	10000	46739		UNNUYYYNY
	BRADFIELD CANAL A-5							
AK7NPA0241	SPUR	56 9.0	H	25.0	0	0	2108.7	YNUUUUU
I 6	OUTER KETCHI NONAME MINOR	131 3.9	IS	0	24000	105000	20. 83	
SOUTHEAST	UNDEVELOPED	10	115.0	1766.0	24000	105000		UNNUUUUYU
	BRADFIELD CANAL A-4.							
AK6NPA0242	WILSON RIVER	58 28.0	H	170.0	0	0	5565.0	YNUUUUU
I 5	OUTER KETCHI WILSON RIVER	130 37.0	IS	0	15000	71000	78.381	
SOUTHEAST	UNDEVELOPED	70	773.0	165.8	15000	71000		UNNUUUUYU
	KETCHIKAN B-2.							

Project Listing(continued)

SITE ID / DEP CODE ACTV INV / GEOG. AREA	PROJECT NAME / PRIMARY CO. -NAME OF STREAM / OWNER / MAP REFERENCE	LATITUDE (D M.M) / LONGITUDE (D M.M) / DR.AREA (SQ.MI)	PROJ.PURP. / STATUS / AVE. Q (CFS)	DAM HT (FT) / TOT. STOR (AC FT) / PWR. HD. (FT)	EXIST.CAP. (KW) / INC. CAP. (KW) / TOT. CAP. (KW)	EXIST.ENRG (MWH) / INC.ENERGY (MWH) / TOT.ENERGY (MWH)	ANUL. COST (1000 $) / ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE / SOCIAL IMPACT CODE
AK7NPA0243	WINSTANLEY	55 24.2	H	50.0	0	0	1476.6	YNUUUUU
I 5	OUTER KETCHI WINSTANLEY CR	130 52.5	IS	0	5000	24140	61.170	
SOUTHEAST	UNDEVELOPED	13	-105.1	344.6	5000	24140		UNNUUUUYU
	KETCHIKAN B-3.							
AK7NPA0104	BLACK BEAR LAKE	56 32.9	H	28.0	0	0	976. 9	YNNYYNN
I 2	PRINCE OF WA BLACK BEAR CR	132 0.5	IS	6900	5000	22000	44.367	
SOUTHEAST	UNDEVELOPED	1	13.5	1458.5	5000	22000		UNNNYUUYY
	CRAIG C-3							
AK7NPA0268	KEGAN CREEK	55 1.1	H	20.0	0	0	940.92	YNUUUUU
I 5	PRINCE OF WA KEGAN CREEK	132 9.2	IS	0	1300	5600	168. 2	
SOUTHEAST	UNDEVELOPED	9	-49.8	109.8	1300	5600		UNNUUUUNU
	CRAIG A-1.							
AK7NPA0269	KLAKAS LAKE	55 0.0	H	50.0	0	0	999.88	NNUUUUU
I 5	PRINCE OF WA UNNAMED	132 22.9	IS	0	2000	10000	99.988	
SOUTHEAST	UNDEVELOPED	11	130.0	119.8	2000	10000		UNNUUUUUU
	CRAIG A-1.							
AK6NPA0271	KUGEL LAKE	55 1.9	H	40.0	0	0	948.88	NNUUUUU
I 5	PRINCE OF WA KUGEL CREEK	132 15.0	IS	0	4000	19000	49.941	
SOUTHEAST	UNDEVELOPED	8	70.0	426.5	4000	19000		UNNUUUUUU
	CRAIG A-1.							
AK7NPA0395	LAKE MARY	55 26.0	H	30.0	0	0	2106.9	NNUUUUU
I 2	PRINCE OF WA OLD FRANKS CR	132 29.0	IS	95000	9600	42300	49.809	
SOUTHEAST	UNDEVELOPED	27	240.0	264.7	9600	42300		UNNUUUUUU
	CRAIG B-2							
AKPNPA0272	LINKUM	55 31.7	H	7.0	17	45	492.89	NNUUUUU
I 6	PRINCE OF WA LINKUM CR KAS	132 23.9	OP	0	4543	8872	55.551	
SOUTHEAST	PACIFIC AMERICAN FISH	1	10.0	300.0	4560	8917		UNNUUUUUU
	CRAIG C-2							
AK6NPA0254	LUCK LAKE	55 57.0	H	120.0	0	0	2245.2	NNUUUUU
I 5	PRINCE OF WA EAGLE CREEK	132 42.9	IS	0	3000	15000	149.68	
SOUTHEAST	UNDEVELOPED	23	200.0	119.8	3000	15000		UNNUUUUUU
	CRAIG							
AK7NPA0255	MELLEN LAKE	55 12.0	H	35.0	0	0	1250.4	NNUUUUU
I 2	PRINCE OF WA REYNOLDS CREE	132 36.0	IS	0	8000	30000	41.682	
SOUTHEAST	UNDEVELOPED	6	62.0	864.1	8000	30000		UNNUUUUUU
	SITKA D-3.							

Project Listing(continued)

SITE ID DEP ACTV CODE INV GEOG. AREA	PROJECT NAME PRIMARY CO. -NAME OF STREAM OWNER MAP REFERENCE	LATITUDE (D M.M) LONGITUDE (D M.M) DR.AREA (SQ.MI)	PROJ.PURP. STATUS AVE. Q (CFS)	DAM HT (FT) TOT. STOR (AC FT) PWR. HD. (FT)	EXIST.CAP. (KW) INC. CAP. (KW) TOT. CAP. (KW)	EXIST.ENRG (MWH) INC.ENERGY (MWH) TOT.ENERGY (MWH)	ANUL. COST (1000 $) ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE SOCIAL IMPACT CODE
AK7NPA0256 I 5 SOUTHEAST	MYRTLE CREEK PRINCE OF WA MYRTLE CREEK UNDEVELOPED CRAIG A-1	55 4.3 132 3.8 4	H IS 76.0	21.0 0 111.8	0 1200 1200	0 5700 5700	609.96 107. 1	NNUUUUU UNNUUUUUU
AK7NPA0257 I 5 SOUTHEAST	NECK ISLAND LAKE PRINCE OF WA NECK ISLAND L UNDEVELOPED PETERSBURG A-4	56 5.9 133 7.9 18	H IS 170.0	55.0 0 119.8	0 3000 3000	0 13580 13580	1492.2 109.88	NNUUUUU UNNUUUUUU
AK7NPA0258 I 5 SOUTHEAST	NIBLACK LAKE PRINCE OF WA MYRTLE CREEK UNDEVELOPED CRAIG A-1	55 4.9 132 7.9 3	H IS 64.0	5.0 0 293.7	0 3000 3000	0 12526 12526	825.14 65.874	NNUUUUU UNNUUUUUU
AK7NPA0259 I 5 SOUTHEAST	REYNOLDS CREEK PRINCE OF WA REYNOLDS CREE UNDEVELOPED CRAIG A-2.	55 14.0 132 34.9 7	H IS 75.0	20.0 0 114.8	0 11000 11000	0 54000 54000	1866.4 34.564	NNUUUUU UNNUUUUUU
AK6NPA0260 I 5 SOUTHEAST	SALMON LAKE PRINCE OF WA KARTA RIVER UNDEVELOPED CRAIG C-2.	55 32.9 132 33.9 48	H IS 459.0	43.0 0 89.9	0 6000 6000	0 27500 27500	2545.2 92.555	NNUUUUU UNNUUUUUU
AK6NPA0261 I 5 SOUTHEAST	SHIPLEY LAKE PRINCE OF WA UNNAMED UNDEVELOPED PETERSBURG A-6.	56 4.9 133 30.0 6	H IS 68.0	45.0 0 109.8	0 1200 1200	0 4979 4979	814.84 163.65	NNUUUUU UNNUUUUUU
AK7NPA0262 I 5 SOUTHEAST	SUKKWAN LAKE PRINCE OF WA SUKKWAN LAKE UNDEVELOPED CRAIG A-3.	55 2.3 132 45.3 7	H IS -36.3	40.0 0 409.5	0 2300 2300	0 10000 10000	779.15 77.915	NNUUUUU UNNUUUUUU
AK6NPA0263 I 5 SOUTHEAST	SUMMIT LAKE PRINCE OF WA SUMMIT LAKE UNDEVELOPED CRAIG B-2	55 34.9 132 33.9 4	H IS 37.0	20.0 0 392.6	0 2000 2000	0 9680 9680	597.79 61.756	NNUUUUU UNNUUUUUU
AK7NPA0264 I 5 SOUTHEAST	THORNE PRINCE OF WA THORNE RIVER UNDEVELOPED CRAIG C-2.	55 42.0 132 37.9 166	H IS 1518.0	25.0 0 102.8	0 17000 17000	0 80000 80000	3826.7 47.834	NNUUUUU UNNUUUUUU

Project Listing(continued)

SITE ID DEP CODE / ACTV INV GEOG. AREA	PROJECT NAME PRIMARY CO. OWNER MAP REFERENCE	NAME OF STREAM	LATITUDE (D M.M) LONGITUDE (D M.M) DR.AREA (SQ.MI)	PROJ.PURP. STATUS AVE. Q (CFS)	DAM HT (FT) TOT. STOR (AC FT) PWR. HD. (FT)	EXIST.CAP. (KW) INC. CAP. (KW) TOT. CAP. (KW)	EXIST.ENRG (MWH) INC.ENERGY (MWH) TOT.ENERGY (MWH)	ANUL. COST (1000 $) ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE SOCIAL IMPACT CODE
AK7NPA0265 I 5 SOUTHEAST	WATERFALL LAKE PRINCE OF WA UNDEVELOPED DIXON ENTRANCE D-4.	WATERFALL LAK	54 58.2 133 6.0 3	H IS -16.3	30.0 0 499.5	0 2000 2000	0 9908 9908	598.57 60.413	NNUUUUU UNNUUUUUU
AK7NPA0266 I 5 SOUTHEAST	WEIGLE LAKE PRINCE OF WA UNDEVELOPED CRAIG A-1.	WEIGLE LAKE	55 3.9 132 11.4 5	H IS 35.0	52.0 0 749.2	0 4000 4000	0 17476 17476	899.43 51.467	YNUUUUU UNNUUUUNU
AKINPA0285 I 4 SO CENTRAL	COOPER LAKE DAM SEWARD CHUGACH ELECTRIC ASSOC. SEWARD B-8	COOPER CREEK	60 26.0 149 49.1 31	H OP *********.0	65.0 112000 700.0	15000 0 15000	41000 0 41000	0 0	NNUUUUU UNNUUUUUU
AK7NPA0273 I 5 SO CENTRAL	CRESCENT LAKE 2 SEWARD UNDEVELOPED SEWARD B-7.	CRESCENT LAKE	60 40.0 149 29.0 23	H IS 55.0	11.0 41000 979.0	0 6000 6000	0 29000 29000	1667.6 57.506	NNUUUUU UNNUYYYNY
AK7NPA0274 I 5 SO CENTRAL	GRANT LAKE SEWARD UNDEVELOPED SEWARD B-7	GRANT LAKE	60 28.0 149 21.0 44	H IS 193.0	50.0 0 250.0	0 8600 8600	0 37776 37776	2275.7 60.242	NNUUUUU UNNUYYYNY
AK6NPA0275 I 5 SO CENTRAL	JUNEAU SEWARD UNDEVELOPED SEWARD C-8	JUNEAU CREEK	60 29.4 149 54.0 50	H IS 111.0	100.0 28000 699.3	0 8000 8000	0 62448 62448	3760.3 60.215	NNUUUUU UNNUYYYYY
AK6NPA0276 D 5 SO CENTRAL	KENAI LAKE SEWARD UNDEVELOPED SEWARD B-8.	KENAI RIVER	60 24.0 149 37.0 660	H IS 2801.0	360.0 0 340.6	0 115000 115000	0 552000 552000	24018 43.511	NNYYYUU UYYUNNNYN
AK6NPA0277 I 5 SO CENTRAL	LOST LAKE SEWARD UNDEVELOPED SEWARD A-7.	LOST CREEK	60 15.9 149 22.0 7	H IS 28.0	10.0 0 1388.6	0 5000 5000	0 25000 25000	959.56 38.382	NNUUUUU UNYUNUUYU
AK6NPA0279 I 5 SO CENTRAL	NELLIE JUAN RIVER SEWARD UNDEVELOPED SEWARD B-5.	NELLIE JUAN R	60 27.0 148 47.0 130	H IS 977.0	195.0 230000 239.7	0 10000 10000	0 47000 47000	4048.3 86.135	NNUUUUU UNNUUUUNU

Project Listing(continued)

SITE ID	PROJECT NAME	LATITUDE	PROJ.PURP.	DAM HT	EXIST.CAP.	EXIST.ENRG	ANUL. COST	ENVIRONMENTAL IMPACT CODE
	PRIMARY CO. -NAME OF STREAM	LONGITUDE	STATUS	TOT. STOR	INC. CAP.	INC.ENERGY	ENERGY COST	
DEP ACTV	OWNER	DR.AREA	AVE. Q	PWR. HD.	TOT. CAP.	TOT.ENERGY		
CODE INV	MAP REFERENCE	(D M.M)		(FT)	(KW)	(MWH)	(1000 $)	
		(D M.M)		(AC FT)	(KW)	(MWH)	($/MWH)	SOCIAL
GEOG. AREA		(SQ.MI)	(CFS)	(FT)	(KW)	(MWH)		IMPACT CODE
AK7NPA0278	NELLIE JUAN RIVER UPPER	60 24.0	H	50.0	0	0	3049.5	NNUUUUU
I 5	SEWARD NELLIE JUAN R	148 49.9	IS	120000	12000	57000	53.500	
SO CENTRAL	UNDEVELOPED	35	262.0	420.5	12000	57000		UNNUYYYNY
	SEWARD B-6.							
AK7NPA0280	PTARMIGAN LAKE PROJECT	60 15.0	H	80.0	0	0	2095.0	NNUNUUU
E 5	SEWARD PTARMIGAN CRE	149 11.9	IS	0	6025	52733	39.728	
SO CENTRAL	UNDEVELOPED	30	138.0	317.6	6025	52733		UYYUUUUYU
	SEWARD B6,7							
AK6NPA0281	RESURRECTION RIVER	60 51.9	H	270.0	0	0	15813	YNUUUUU
I 5	SEWARD RESURRECTION	149 41.9	IS	0	18000	86000	183.87	
SO CENTRAL	UNDEVELOPED	141	828.0	232.7	18000	86000		UNNUUUUYN
	SEWARD A-7.							
AK7NPA0283	SNOW	60 17.9	H	310.0	0	0	8685.5	NNUUUUU
I 2	SEWARD SNOW RIVER	149 18.0	IS	0	63000	278000	31.242	
SO CENTRAL	UNDEVELOPED	85	710.0	652.3	63000	278000		UNNUUUUUU
	SEWARD B-7.							
AK6NPA0284	SUNRISE LAKE	60 51.9	H	400.0	0	0	13908	NNUUUUU
I 5	SEWARD SIXMILE CREEK	149 26.9	IS	0	11000	52000	267.46	
SO CENTRAL	UNDEVELOPED	238	483.0	326.6	11000	52000		UNYUUUUYU
	SEWARD D-7.							
AK7NPA0313	ANDEAN LAKE	56 18.9	H	78.0	0	0	738.30	NNUUUUU
I 5	SITKA ANDEAN CREEK	134 47.2	IS	6180	1100	4818	153.23	
SOUTHEAST	UNDEVELOPED	2	40.0	874.1	1100	4818		UNNUUUUUU
	PORT ALEXANDER B-3.							
AK7NPA0314	ANTLER LAKE	58 46.9	H	56.0	0	0	1408.2	NNUUUUU
I 6	SITKA ANTLER RIVER	134 30.0	IS	29000	9000	43000	32.749	
SOUTHEAST	UNDEVELOPED	5	40.0	1850.0	9000	43000		UNNUUUUUU
	JUNEAU D-3.							
AK7NPA0315	BARANOF LAKE	57 9.0	H	60.0	0	0	1518.1	NNUUUUU
I 5	SITKA BARANOF RIVER	134 52.9	IS	0	2000	11000	138. 1	
SOUTHEAST	UNDEVELOPED	32	436.0	107.8	2000	11000		UNNUUUUUU
	SITKA A-3.							
AK7NPA0316	BATURIN LAKE	56 24.0	H	5.0	0	0	569.77	NNUUUUU
I 6	SITKA BATURIN CREEK	134 48.0	IS	0	1400	54351	10.483	
SOUTHEAST	UNDEVELOPED	3	30.0	1098.9	1400	54351		UNNUUUUUU
	PORT ALEXANDER B-3.							

Project Listing(continued)

SITE ID DEP CODE / ACTV INV GEOG. AREA	PROJECT NAME PRIMARY CO. -NAME OF STREAM OWNER MAP REFERENCE	LATITUDE (D M.M) LONGITUDE (D M.M) DR.AREA (SQ.MI)	PROJ.PURP. STATUS AVE. Q (CFS)	DAM HT (FT) TOT. STOR (AC FT) PWR. HD. (FT)	EXIST.CAP. (KW) INC. CAP. (KW) TOT. CAP. (KW)	EXIST.ENRG (MWH) INC.ENERGY (MWH) TOT.ENERGY (MWH)	ANUL. COST (1000 $) ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE SOCIAL IMPACT CODE
AK6NPA0317 I 5 SOUTHEAST	BENZEMAN LAKE SITKA BENZEMAN RIVE UNDEVELOPED PORT ALEXANDER D-4.	56 45.0 135 0.0 32	H IS 400.0	30.0 0 103.8	0 6323 6323	0 27695 27695	2762.7 99.756	NNUNUUU UNNUUUUUU
AK6NPA0318 I 5 SOUTHEAST	BLANCHARD LAKE SITKA BLANCHARD CRE UNDEVELOPED PORT ALEXANDER C-3.	56 36.9 134 40.0 3	H IS 65.0	30.0 0 389.6	0 2000 2000	0 50902 50902	728. 9 14.303	NNUUUUU UNNUUUUUU
AKINPA0339 I 4 SOUTHEAST	BLUE LAKE DAM SITKA SAWMILL CREEK CITY OF SITKA SITKA A-2	57 3.7 135 11.4 38	HS OP -503.0	170.0 200000 350.0	6000 0 6000	35000 0 35000	0 0	NNUUUUU UNNUUUUUU
AK7NPA0319 I 2 SOUTHEAST	BORODINO LAKE SITKA BIG PORT WALT UNDEVELOPED PORT ALEXANDER B-3.	56 22.3 134 42.9 3	H IS 66.0	5.0 28000 479.5	0 5000 5000	0 24300 24300	1081.7 44.516	NNUUUUU UNNUUUUUU
AK7NPA0320 I 6 SOUTHEAST	BRENTWOOD CREEK SITKA BRENTWOOD CRE UNDEVELOPED PORT ALEXANDER C-3.	56 37.3 134 40.0 7	H IS 135.0	30.0 11000 654.3	0 8000 8000	0 38000 38000	1483.7 39. 45	NNUUUUU UNNUUUUUU
AK7NPA0321 I 2 SOUTHEAST	CARBON LAKE SITKA UNNAMED UNDEVELOPED SITKA A-3.	57 1.9 134 28.1 27	H IS 483.0	65.0 56880 259.7	0 10000 10000	0 49000 49000	2849.8 58.160	NNUUUUU UNNUUUUUU
AK7NPA0322 I 5 SOUTHEAST	CLIFF LAKE SITKA UNNAMED UNDEVELOPED PORT ALEXANDER C-3.	56 31.9 134 45.9 6	H IS -89.0	20.0 0 127.8	0 1700 1700	0 7584 7584	818.46 107.91	NNUUUUU UNNUUUUUU
AK7NPA2606 I 5 SOUTHEAST	DAVIDOF LAKE SITKA DAVIDOF CREEK UNDEVELOPED PORT ALEXANDER C-3.	56 36.3 134 50.2 8	H IS 85.0	15.0 0 274.7	0 4426 4426	0 19387 19387	1185.0 61.124	NNUUUUU UNNUUUUUU
AK7NPA2609 I 5 SOUTHEAST	DEEP LAKE SITKA DEEP CREEK UNDEVELOPED PORT ALEXANDER D-3.	56 51.3 134 44.0 7	H IS 38.9	40.0 0 264.7	0 1500 1500	0 6174 6174	588.46 95.314	NNUUUUU UNNUUUUUU

Project Listing(continued)

SITE ID	PROJECT NAME		LATITUDE	PROJ.PURP.		DAM HT	EXIST.CAP.	EXIST.ENRG	ANUL. COST	ENVIRONMENTAL
	PRIMARY CO. -NAME OF STREAM		LONGITUDE	STATUS		TOT. STOR	INC. CAP.	INC.ENERGY	ENERGY COST	IMPACT CODE
DEP ACTV	OWNER		DR.AREA	AVE. Q		PWR. HD.	TOT. CAP.	TOT.ENERGY		
CODE INV	MAP REFERENCE		(D M.M)			(FT)	(KW)	(MWH)	(1000 $)	
			(D M.M)			(AC FT)	(KW)	(MWH)	($/MWH)	SOCIAL
GEOG. AREA			(SQ.MI)		(CFS)	(FT)	(KW)	(MWH)		IMPACT CODE
AK7NPA0323	DEER LAKE		56 31.7	H		40.0	0	0	1770.7	NNUUUUU
I 5	SITKA	UNNAMED PARAN	134 40.0	IS		0	7000	31000	57.120	
SOUTHEAST	UNDEVELOPED		7		160.0	338.6	7000	31000		UNNUUUUUU
	PORT ALEXANDER C-3									
AK7NPA0325	DIANA LAKE		56 53.0	H		5.0	0	0	1318.0	NNUUUUU
I 2	SITKA	UNNAMED	135 3.0	IS		0	8000	35000	37.658	
SOUTHEAST	UNDEVELOPED		4		36.0	1473.5	8000	35000		UNNUUUUUU
	PORT ALEXANDER D-4.									
AK7NPA0326	DIDRICKSON LAKE		57 45.0	H		36.0	0	0	914.21	YNUUUUU
I 5	SITKA	DIDRICKSON LA	136 11.0	IS		0	2500	10000	91.421	
SOUTHEAST	UNDEVELOPED		15		180.0	119.8	2500	10000		UNNUUUUUU
	SITKA C-5.									
AK7NPA0327	FINGER LAKE		56 36.1	H		40.0	0	0	762.33	NNUUUUU
I 6	SITKA	FINGER CREEK	134 41.3	IS		0	3000	14000	54.452	
SOUTHEAST	UNDEVELOPED		2		-25.9	739.2	3000	14000		UNNUUUUUU
	PORT ALEXANDER C-3.									
AK7NPA0328	FOUR FALLS LAKE		57 1.9	H		45.0	0	0	1076.4	NNUUUUU
I 5	SITKA	UNNAMED	134 45.9	IS		16500	4500	20000	53.822	
SOUTHEAST	UNDEVELOPED		1		23.0	1348.6	4500	20000		UNNUUUUUU
	SITKA A-3.									
AK7NPA0329	FURUHELM		56 23.0	H		25.0	0	0	840.73	NNUUUUU
E 5	SITKA	FURUHELM RIVE	134 48.0	IS		0	3000	13315	63.142	
SOUTHEAST	UNDEVELOPED		16		200.0	99.9	3000	13315		UNNUUUUUU
	PORT ALEXANDER B-3.									
AK7NPA0330	GOULDING LAKE LOWER		57 46.9	H		10.0	0	0	1370.3	YNUUUUU
E 5	SITKA	GOULDING LAKE	136 14.0	IS		1700	2865	12549	109.19	
SOUTHEAST	UNDEVELOPED		27		340.0	65.0	2865	12549		UNNUUUUNU
	SITKA D-7									
AK7NPA0331	GOULDING LAKE UPPER		57 48.3	H		26.0	0	0	2450.0	YNUUUUU
E 5	SITKA	GOULDING LAKE	136 12.9	IS		57000	9000	41000	59.756	
SOUTHEAST	UNDEVELOPED		25		270.0	122.8	9000	41000		UNNUUUUNU
	SITKA D-6.									
AK7NPA0332	GREEN LAKE		56 95.30	H		200.0	0	0	3101.9	NNNNNNN
I 2	SITKA	VODOPAD RIVER	135 11.60	UC		0	16600	64000	48.467	
SOUTHEAST	UNDEVELOPED		28		291.0	344.6	16600	64000		NNNUYYYYY
	PORT ALEXANDER D-4									

Project Listing(continued)

SITE ID / DEP CODE, ACTV INV / GEOG. AREA	PROJECT NAME / PRIMARY CO. -NAME OF STREAM / OWNER / MAP REFERENCE	LATITUDE (D M.M) / LONGITUDE (D M.M) / DR.AREA (SQ.MI)	PROJ.PURP. / STATUS / AVE. Q (CFS)	DAM HT (FT) / TOT. STOR (AC FT) / PWR. HD. (FT)	EXIST.CAP. (KW) / INC. CAP. (KW) / TOT. CAP. (KW)	EXIST.ENRG (MWH) / INC.ENERGY (MWH) / TOT.ENERGY (MWH)	ANUL. COST (1000 $) / ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE / SOCIAL IMPACT CODE
AK6NPA0333	HIDDEN FALLS LAKES	57 13.0	H	5.0	0	0	1434.5	NNUUUUU
I 6	SITKA UNNAMED CREEK	134 52.9	IS	0	8000	36277	39.543	
SOUTHEAST	UNDEVELOPED	8	-105.9	494.5	8000	36277		UNNUUUUUU
	SITKA A-3.							
AK6NPA0334	HIDDEN FALLS LAKE UPPER	57 13.0	H	10.0	0	0	783.83	NNUUUUU
D 6	SITKA UNNAMED	134 52.9	IS	0	4500	19882	39.424	
SOUTHEAST	UNDEVELOPED	2	33.0	904.0	4500	19882		UNNUUUUUU
	SITKA A-3.							
AK7NPA0335	KASNYKU LAKE	57 11.0	H	20.0	0	0	1248.8	NNUUUUU
I 2	SITKA KASNYKU FALLS	134 49.9	IS	0	7000	30000	41.626	
SOUTHEAST	UNDEVELOPED	5	70.0	650.3	7000	30000		UNNUUUUUU
	SITKA A-3.							
AK7NPA0336	KELP	57 20.9	H	145.0	0	0	4272.7	NNUUUUU
I 5	SITKA UNNAMED	135 4.9	IS	0	16000	66000	64.738	
SOUTHEAST	UNDEVELOPED	21	222.0	611.3	16000	66000		UNNUUUUUU
	SITKA B-4.							
AK7NPA0337	LAKE EKATERINA	56 50.9	H	10.0	0	0	856.85	NNUUUUU
I 5	SITKA UNNAMED	135 3.3	IS	0	1000	4500	190.41	
SOUTHEAST	UNDEVELOPED	15	-86.2	81.9	1000	4500		UNNUUUUUU
	PORT ALEXANDER D-4.							
AK6NPA0289	LAKE IRINA	56 55.0	H	33.0	0	0	776.41	NNUUUUU
I 5	SITKA UNNAMED	135 7.9	IS	0	1905	9479	81.900	
SOUTHEAST	UNDEVELOPED	1	15.0	910.0	1905	9479		UNNUUUUUU
	PORT ALEXANDER D-4							
AK7NPA0291	MAKSOUTOF RIVER	56 30.0	H	80.0	0	0	2747.1	NNUUUUU
I 2	SITKA MAKSOUTOF RIV	134 57.9	IS	0	24000	117000	23.479	
SOUTHEAST	UNDEVELOPED	24	375.0	569.4	24000	117000		UNNUUUUUU
	PORT ALEXANDER C-3.							
AK7NPA0294	MILK LAKE	56 58.0	H	30.0	0	0	1290.3	NNUUUUU
I 2	SITKA MILK CREEK	134 47.0	IS	0	7000	33000	39.101	
SOUTHEAST	UNDEVELOPED	11	230.0	665.3	7000	33000		UNNUUUUUU
	PORT ALEXANDER B-3							
AK7NPA0295	NAKVASSIN LAKE	56 27.0	H	30.0	0	0	718.22	NNUUUUU
I 5	SITKA NAKVASSIN CRE	134 44.0	IS	0	1800	7689	93.409	
SOUTHEAST	UNDEVELOPED	4	66.0	174.8	1800	7689		UNNUUUUUU
	PORT ALEXANDER B-3							

Project Listing(continued)

SITE ID / DEP CODE ACTV INV / GEOG. AREA	PROJECT NAME / PRIMARY CO. -NAME OF STREAM / OWNER / MAP REFERENCE	LATITUDE (D M.M) / LONGITUDE (D M.M) / DR.AREA (SQ.MI)	PROJ.PURP. / STATUS / AVE. Q (CFS)	DAM HT (FT) / TOT. STOR (AC FT) / PWR. HD. (FT)	EXIST.CAP. (KW) / INC. CAP. (KW) / TOT. CAP. (KW)	EXIST.ENRG (MWH) / INC.ENERGY (MWH) / TOT.ENERGY (MWH)	ANUL. COST (1000 $) / ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE / SOCIAL IMPACT CODE
AK6NPA0296	NELSON LAKE	56 56.0	H	40.0	0	0	1178.7	NNUUUUU
I 6	SITKA UNNAMED	134 45.0	IS	35000	5600	24800	47.529	
SOUTHEAST	UNDEVELOPED	6	85.0	439.5	5600	24800		UNNUUUUUU
	PORT ALEXANDER D-3							
AK7NPA0297	OSPREY LAKE	56 24.0	H	38.0	0	0	694.45	NNUUUUU
I 5	SITKA NEW PORT WALT	134 40.0	IS	0	2000	9260	74.994	
SOUTHEAST	UNDEVELOPED	2	55.2	251.7	2000	9260		UNNUUUUUU
	PORT ALEXANDER B-2							
AK7NPA0298	PARRY LAKE	56 39.0	H	45.0	0	0	1210.7	NNUUUUU
I 6	SITKA PARRY CREEK	134 41.0	IS	0	5000	23967	50.515	
SOUTHEAST	UNDEVELOPED	6	-96.0	374.6	5000	23967		UNNUUUUUU
	PORT ALEXANDER C-3							
AK6NPA0299	PATTERSON	57 38.0	H	10.0	0	0	836.55	YNUUUUU
I 5	SITKA PATTERSON LAK	135 48.0	IS	0	4000	17750	47.129	
SOUTHEAST	UNDEVELOPED	5	62.0	429.5	4000	17750		UNNUUUUYU
	SITKA C-6							
AKINPA0346	PELICAN CREEK	57 34.7	H	22.0	500	2000	128.36	NNUUUUU
I 2	SITKA PELICAN CREEK	136 7.8	OP	200	1000	1700	75.507	
SOUTHEAST	PELICAN UTIL. CO.	12	150.0	120.0	1500	3700		UNNUUUUUU
	SITKA D-7							
AK7NPA0300	PLOTNIKOF LAKE	56 34.9	H	75.0	0	0	2098.8	NNUUUUU
I 6	SITKA UNNAMED	134 57.9	IS	0	9000	44000	47.702	
SOUTHEAST	UNDEVELOPED	20	309.0	314.6	9000	44000		UNNUUUUUU
	PORT ALEXANDER C-3							
AK6NPA0303	POINT SULLIVAN	56 41.0	H	45.0	0	0	542.46	NNUUUUU
I 6	SITKA UNNAMED	134 19.9	IS	0	2000	9653	56.196	
SOUTHEAST	UNDEVELOPED	1	10.0	1448.5	2000	9653		UNNUUUUUU
	PORT ALEXANDER C-2							
AK7NPA0302	PORT ARMSTRONG	56 17.5	H	26.0	0	0	1047.0	NNUUUUU
I 5	SITKA SHECKLEY CREE	134 39.4	IS	0	3500	15782	66.344	
SOUTHEAST	UNDEVELOPED	7	-87.8	269.7	3500	15782		UNNUUUUUU
	PORT ALEXANDER B-2.							
AK7NPA0292	PULP MILL	57 1.3	H	30.0	0	0	688.95	NNUUUUU
I 5	SITKA MEDVETCHA	135 7.0	IS	0	1500	7400	93.101	
SOUTHEAST	UNDEVELOPED	7	-52.9	209.7	1500	7400		UNNUUUUUU
	SITKA A-3							

Project Listing(continued)

SITE ID	PROJECT NAME	LATITUDE	PROJ.PURP.	DAM HT	EXIST.CAP.	EXIST.ENRG	ANUL. COST	ENVIRONMENTAL IMPACT CODE
	PRIMARY CO. -NAME OF STREAM	LONGITUDE	STATUS	TOT. STOR	INC. CAP.	INC.ENERGY	ENERGY COST	
DEP ACTV	OWNER	DR.AREA	AVE. Q	PWR. HD.	TOT. CAP.	TOT.ENERGY		
CODE INV	MAP REFERENCE	(D M.M)		(FT)	(KW)	(MWH)	(1000 $)	
		(D M.M)		(AC FT)	(KW)	(MWH)	($/MWH)	SOCIAL
GEOG. AREA		(SQ.MI)	(CFS)	(FT)	(KW)	(MWH)		IMPACT CODE
AK7NPA2603	REDOUBT LAKE	56 56.0	H	12.0	0	0	2021.1	NNUUUUU
I 5	SITKA UNNAMED CASCA	135 15.9	IS	180000	1600	7049	286.72	
SOUTHEAST	UNDEVELOPED	40	-286.2	19.9	1600	7049		UNNUUUUUU
	PORT ALEXANDER D-4							
AK7NPA0304	ROSTISLOF LAKE	56 28.2	H	20.0	0	0	1815.8	NNUUUUU
I 5	SITKA ROSTISLOF CRE	134 41.3	IS	0	6813	29842	60.848	
SOUTHEAST	UNDEVELOPED	4	81.5	549.4	6813	29842		UNNUUUUUU
	PORT ALEXANDER B-3							
AK6NPA0306	RUST LAKE 2	57 35.9	H	3.0	0	0	1323.7	NNUUUUU
D 6	SITKA RUST CREEK	135 59.0	IS	0	8000	34160	38.752	
SOUTHEAST	UNDEVELOPED	7	70.0	732.2	8000	34160		UNNUUUUUU
	SITKA C-6							
AK6NPA0307	SADIE	57 4.9	H	10.0	0	0	675.69	NNUUUUU
I 5	SITKA WAXMAN CREEK	134 48.9	IS	0	2500	10835	62.362	
SOUTHEAST	UNDEVELOPED	3	35.0	464.5	2500	10835		UNNUUUUUU
	SITKA A-3.							
AK7NPA0308	SASHIN LAKE	56 21.3	H	15.0	0	0	707. 6	NNUUUUU
I 5	SITKA SASHIN CREEK	134 41.3	IS	0	2500	10867	65. 64	
SOUTHEAST	UNDEVELOPED	3	-37.1	439.5	2500	10867		UNNUUUUUU
	PORT ALEXANDER B-3							
AK8NPA0341	SHECKLEY	56 17.9	H	15.0	28	254	0	NNUUUUU
I 5	SITKA SKECKLEY CR	134 41.9	OP	0	0	0	0	
SOUTHEAST	BUCHAN & HEINEN PACKING CO	5	100.0	270.0	28	254		UNNUUUUUU
	PORT ALEXANDER B-2							
AK7NPA0309	SULOIA LAKE	57 25.0	H	10.0	0	0	964.82	YNUUUUU
I 5	SITKA SOLOIA CREEK	135 41.9	IS	0	2000	8760	110.13	
SOUTHEAST	UNDEVELOPED	9	-75.0	204.7	2000	8760		UNNUUUUYU
	SITKA B-5.							
AK5NPA0288	SUPERIOR	57 47.1	H	5.0	10	43	407.80	NNUUUUU
I 6	SITKA HARLEY CREEK	135 5.1	OP	0	743	3254	125.31	
SOUTHEAST	SUPERIOR PKG CO	3	30.0	163.0	753	3298		UNNUUUUUU
	SITKA D-4							
AK7NPA0311	TAKATZ CREEK	57 6.9	H	205.0	0	0	3344.6	YNNNNUU
I 2	SITKA TAKATZ CREEK	134 51.0	IS	145800	20000	97000	34.480	
SOUTHEAST	UNDEVELOPED	10	180.0	990.0	20000	97000		UNNUUUUUU
	SITKA A-3.							

Project Listing(continued)

SITE ID	PROJECT NAME	LATITUDE	PROJ.PURP.	DAM HT	EXIST.CAP.	EXIST.ENRG	ANUL. COST	ENVIRONMENTAL IMPACT CODE
	PRIMARY CO. -NAME OF STREAM	LONGITUDE	STATUS	TOT. STOR	INC. CAP.	INC.ENERGY	ENERGY COST	
DEP ACTV	OWNER	DR.AREA	AVE. Q	PWR. HD.	TOT. CAP.	TOT.ENERGY		
CODE INV	MAP REFERENCE	(D M.M)		(FT)	(KW)	(MWH)	(1000 $)	
		(D M.M)		(AC FT)	(KW)	(MWH)	($/MWH)	SOCIAL
GEOG. AREA		(SQ.MI)	(CFS)	(FT)	(KW)	(MWH)		IMPACT CODE
AK7NPA0354	ABYSS LAKE	58 30.0	H	100.0	0	0	1562.2	YNUUUUU
I 5	SKAGWAY-YAKU DUNDAS RIVER	136 33.0	IS	11000	3500	17476	89.395	
SOUTHEAST	UNDEVELOPED	8	100.0	499.5	3500	17476		UNNUUUUNU
	MT FAIRWEATHER C-2.							
AK6NPA0355	ALSEK RIVER	59 22.1	H	230.0	0	0	112495	YNUUUUU
I 6	SKAGWAY-YAKU ALSEK RIVER	138 7.1	IS	100	2251179	4065703	27.669	
SOUTHEAST	UNDEVELOPED	11000	16560.0	165.8	2251179	4065703		UNNUUUNNU
	YAKUTAT B-1.							
AK4NPA0078	DAYEBAS CREEK	59 17.2	H	15.0	0	0	1199.6	NNNNYUU
I 2	SKAGWAY-YAKU DAYEBAS CREEK	135 2.0	IS	0	5000	18190	65.951	
SOUTHEAST	UNDEVELOPED	11	85.5	344.6	5000	18190		UNNNUUUYU
	SKAGWAY B-1							
AKINPA0359	DEWEY LAKES	59 26.4	HS	20.0	480	1000	108.41	NNUUUUU
I 2	SKAGWAY-YAKU DEWEY CREEK	135 18.9	OP	410	1000	1300	83.397	
SOUTHEAST		7	30.0	399.6	1480	2300		UNNUUUUUU
	SKAGWAY B-1							
AK7NPA0357	GOAT LAKE	59 31.3	H	15.0	0	0	1555.2	NNUUUUU
I 2	SKAGWAY-YAKU PITCHFORK FAL	135 11.0	IS	0	10000	46000	33.808	
SOUTHEAST	UNDEVELOPED	4	29.0	1868.1	10000	46000		UNNUUUUUU
	SKAGWAY C-1.							
AK7NPA0358	KOOK LAKE	57 40.0	H	20.0	0	0	1040.5	NNUUUUU
I 5	SKAGWAY-YAKU KOOK CREEK	134 59.0	IS	0	1000	6000	173.43	
SOUTHEAST	UNDEVELOPED	29	-150.7	59.9	1000	6000		UNNUUUUUU
	SITKA C-4.							
AK7NPA0348	PELICAN	57 57.2	H	22.0	0	0	726.85	NNUUUUU
I 5	SKAGWAY-YAKU PELICAN COVE	136 12.9	IS	0	1500	6270	115.92	
SOUTHEAST	UNDEVELOPED	13	-81.0	120.0	1500	6270		UNNUUUUUU
	SITKA D-7							
AK7NPA0349	SITKOH LAKE	57 30.3	H	10.0	0	0	948.73	NNUUUUU
I 5	SKAGWAY-YAKU SITKOH CREEK	135 4.9	IS	0	1400	6010	157.85	
SOUTHEAST	UNDEVELOPED	9	-48.8	185.0	1400	6010		UNNUUUUUU
	SITKA C-4.							
AK7NPA0351	WEST CREEK TAIYA	59 31.7	H	110.0	0	0	3740.9	NNUUUUU
I 5	SKAGWAY-YAKU WEST CREEK TA	135 21.0	IS	0	21000	105000	35.628	
SOUTHEAST	UNDEVELOPED	39	400.0	749.2	21000	105000		UNNUUUUUU
	SKAGWAY C-1,C-2.							

Project Listing(continued)

SITE ID	PROJECT NAME	LATITUDE	PROJ.PURP.	DAM HT	EXIST.CAP.	EXIST.ENRG	ANUL. COST	ENVIRONMENTAL
	PRIMARY CO. -NAME OF STREAM	LONGITUDE	STATUS	TOT. STOR	INC. CAP.	INC.ENERGY	ENERGY COST	IMPACT CODE
DEP ACTV	OWNER	DR.AREA	AVE. Q	PWR. HD.	TOT. CAP.	TOT.ENERGY		
CODE INV	MAP REFERENCE	(D M.M)		(FT)	(KW)	(MWH)	(1000 $)	
		(D M.M)		(AC FT)	(KW)	(MWH)	($/MWH)	SOCIAL
GEOG. AREA		(SQ.MI)	(CFS)	(FT)	(KW)	(MWH)		IMPACT CODE
AK6NPA0352	WOOD	58 34.9	H	35.0	0	0	1120.7	YNUUUUU
I 5	SKAGWAY-YAKU WOOD LAKE	136 27.9	IS	0	3000	13315	84.172	
SOUTHEAST	UNDEVELOPED	10	100.0	199.8	3000	13315		UNNUUUUNU
	MT FAIRWEATHER C-2.							
AK7NPA0353	YUKON-TAIYA	59 33.9	H	100.0	0	0	69448	NNUUUUU
I 6	SKAGWAY-YAKU TAIYA	135 19.9	IS	0	3200000	21000000	3.3070	
SOUTHEAST	UNDEVELOPED	25700	18647.0	1911.0	3200000	21000000		UNNUUUUUU
	SKAGWAY C-1.							
AK6NPA0360	BIG DELTA	64 9.3	H	120.0	0	0	30344	NNYYUUU
I 6	S.E. FAIRBAN TANANA RIVER	145 3.0	IS	0	226000	987000	30.744	
YUKON	UNDEVELOPED	15300	17266.0	98.9	226000	987000		UNNUYYYNY
	BIG DELTA A-4.							
AK6NPA0361	CATHEDRAL BLUFFS	63 23.2	H	160.0	0	0	15820	NNYYYUU
D 6	S.E. FAIRBAN TANANA RIVER	143 44.3	IS	5800000	158000	693000	22.829	
YUKON	UNDEVELOPED	8550	8011.0	145.8	158000	693000		UYYUUUUNU
	TANACROSS B-6.							
AK7NPA0362	CHISANA RIVER	62 16.9	H	200.0	0	0	11028	YNUUUUU
I 6	S.E. FAIRBAN CHISANA RIVER	142 9.9	IS	0	170000	797000	13.837	
YUKON	UNDEVELOPED	732	600.0	882.1	170000	797000		UNNUUUUNU
	NABESNA D-3							
AK6NPA0363	GOODPASTER	64 30.0	H	200.0	0	0	6125.6	NNUUUUU
I 5	S.E. FAIRBAN GOODPASTER RI	144 30.0	IS	270000	13000	56250	144.45	
YUKON	UNDEVELOPED	517	497.0	169.8	13000	56250		UYYUNUUNN
	BIG DELTA B-5.							
AK6NPA2615	JOHNSON	63 43.2	H	140.0	0	0	18118	NNUUYUY
I 6	S.E. FAIRBAN TANANA RIVER	144 37.0	IS	0	210000	920000	19.694	
YUKON	UNDEVELOPED	10450	10800.0	148.8	210000	920000		UYYUNNNYY
	WISEMAN A-4.							
AK6NPA2631	NABESNA	62 45.5	H	200.0	0	0	12595	YNUUUUU
I 5	S.E. FAIRBAN NABESNA RIVER	142 10.0	IS	0	66000	320000	39.360	
YUKON	UNDEVELOPED	2145	1300.0	190.8	66000	320000		UNNUNUUNU
	NABESNA D-3							
AK7NPA2633	ROCK LAKE	61 57.0	H	30.0	0	0	3285.9	YNUUUUU
I 5	S.E. FAIRBAN PTARIGAN CREE	141 19.9	IS	0	12000	58000	56.654	
YUKON	UNDEVELOPED	93	193.0	513.4	12000	58000		UNNUUUUNU
	MCCARTHY D-1.							

Project Listing(continued)

SITE ID	PROJECT NAME	LATITUDE	PROJ.PURP.	DAM HT	EXIST.CAP.	EXIST.ENRG	ANUL. COST	ENVIRONMENTAL
	PRIMARY CO. -NAME OF STREAM	LONGITUDE	STATUS	TOT. STOR	INC. CAP.	INC.ENERGY	ENERGY COST	IMPACT CODE
DEP ACTV	OWNER	DR.AREA	AVE. Q	PWR. HD.	TOT. CAP.	TOT.ENERGY		
CODE INV	MAP REFERENCE	(D M.M)		(FT)	(KW)	(MWH)	(1000 $)	
		(D M.M)		(AC FT)	(KW)	(MWH)	($/MWH)	SOCIAL
GEOG. AREA		(SQ.MI)	(CFS)	(FT)	(KW)	(MWH)		IMPACT CODE
AK6NPA0364	SALCHA RIVER	64 38.2	H	190.0	0	0	15382	NNUUUUU
I 5	S.E. FAIRBAN SALCHA RIVER	145 26.9	IS	550000	25000	123000	125. 5	
YUKON	UNDEVELOPED	1990	1600.0	135.8	25000	123000		UNNUUUNYU
	BIG DELTA C-5.							
AK7NPA0365	AFTERBAY	66 54.8	H	120.0	0	0	8455.4	NNUUUUU
E 5	UPPER YUKON E F CHANDALAR	147 10.0	IS	148000	25000	122000	69.306	
YUKON	UNDEVELOPED	5500	2070.0	98.9	25000	122000		YNNUUUNUU
	CHANDALAR A-1.							
AK6NPA0366	BIRCH	65 20.9	H	210.0	0	0	6813.6	NYUUUUU
I 5	UPPER YUKON BIRCH CREEK	144 47.0	IS	0	37291	117601	57.938	
YUKON	UNDEVELOPED	730	550.0	199.8	37291	117601		UNNUUNNYU
	CIRCLE B-2							
AK7NPA0367	EAST FORK CHANDALAR	68 1.9	H	110.0	0	0	8461.6	NNUUUUU
D 5	UPPER YUKON E F CHANDALAR	145 52.9	IS	0	19000	90000	94. 18	
YUKON	UNDEVELOPED	2500	938.0	162.0	19000	90000		YNNUUUNNU
	ARCTIC							
AK6NPA0368	FORTYMILE	64 16.0	H	400.0	0	0	11613	NYUUUUU
D 6	UPPER YUKON FORTYMILE RIV	141 14.0	IS	0	166000	723000	16. 62	
YUKON	UNDEVELOPED	6060	4462.0	323.6	166000	723000		UNNUUUNNU
	EAGLE B-1.							
AK6NPA0369	FORTYMILE N E	64 20.0	H	300.0	0	0	7291.8	NYUUUUU
D 5	UPPER YUKON NORTH FORK FO	141 57.9	IS	0	51000	245000	29.762	
YUKON	UNDEVELOPED	2065	1298.0	248.7	51000	245000		UNNUUUNNU
	EAGLE B-2.							
AK6NPA0370	FORTYMILE SF	64 31.9	H	230.0	0	0	8663.8	NYUUUUU
D 5	UPPER YUKON SOUTH FORK FO	142 0.0	IS	0	51000	245000	35.362	
YUKON	UNDEVELOPED	2800	2070.0	227.7	51000	245000		UNNUUUNNU
	EAGLE A-2.							
AK6NPA2628	LITTLE ROCK	67 13.8	H	160.0	0	0	9965.8	YNUUUUU
D 5	UPPER YUKON E F CHANDALAR	146 8.9	IS	0	25000	119000	83.746	
YUKON	UNDEVELOPED	4200	3700.0	131.8	25000	119000		UNNUNUNNU
	CHRISTIAN C-5.							
AK6NPA0371	WOODCHOPPER	65 21.2	H	385.0	0	0	151000	YNUUUUU
I 6	UPPER YUKON YUKON RIVER	143 21.0	IS	69500000	2160000	14200000	10.633	
YUKON	UNDEVELOPED	122000	79562.0	299.7	2160000	14200000		UNNUUUNNU
	CHARLEY B-5.							

Project Listing(continued)

SITE ID DEP CODE / ACTV INV GEOG. AREA	PROJECT NAME PRIMARY CO. OWNER MAP REFERENCE	NAME OF STREAM	LATITUDE (D M.M) LONGITUDE (D M.M) DR.AREA (SQ.MI)	PROJ.PURP. STATUS AVE. Q (CFS)	DAM HT (FT) TOT. STOR (AC FT) PWR. HD. (FT)	EXIST.CAP. (KW) INC. CAP. (KW) TOT. CAP. (KW)	EXIST.ENRG (MWH) INC.ENERGY (MWH) TOT.ENERGY (MWH)	ANUL. COST (1000 $) ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE SOCIAL IMPACT CODE
AK6NPA0372 D 5 YUKON	ZIMMERMAN UPPER YUKON UNDEVELOPED CHANDALAR B-1.	UNNAMED	67 0.0 147 4.3 5500	H IS 2070.0	190.0 0 168.8	0 44000 44000	0 210000 210000	14833 70.635	NNUUUUU YNNUUUNNU
AK6NPA2619 I 6 YUKON	PORCUPINE UPPER-YUKON UNDEVELOPED COLEEN B-1.	PORCUPINE RIV	67 19.2 141 25.0 23400	H IS 13000.0	340.0 0 312.6	0 530000 530000	0 2320000 2320000	29496 12.714	NYUUUUU UNNUUUUNU
AK7NPA0041 I 2 SO CENTRAL	ALLISON CREEK VALDEZ-CHIT- UNDEVELOPED VALDEZ A-7	ALLISON CREEK	61 7.1 146 10.2 5	H IS 49.0	1.0 19980 1168.8	0 8000 8000	0 37250 37250	1198.0 32.163	NNUYNNN NNNNYNYYY
AK6NPA0374 I 6 SO CENTRAL	GAKONA SITE VALDEZ-CHIT- UNDEVELOPED GULKANA B-3.	COPPER RIVER	62 26.0 145 40.0 3935	H IS 6072.0	280.0 0 265.7	0 150000 150000	0 727000 727000	27476 37.793	YNUUUUU UNNUUUUNU
AK6NPA0373 D 5 YUKON	GERSTLE VALDEZ-CHIT- UNDEVELOPED MOUNT HAYES D-2.	TANANA RIVER	63 49.9 144 48.0 10700	H IS 13122.0	100.0 0 58.9	0 100000 100000	0 438000 438000	19924 45.490	NNUUUUU UNNUUUUUU
AK6NPA0378 D 5 SO CENTRAL	GULKANA RIVER UPPER VALDEZ-CHIT- UNDEVELOPED GULKANA B-3.	GULKANA RIVER	62 27.0 145 30.0 1770	H IS 2622.0	150.0 0 123.8	0 9000 9000	0 45000 45000	4975.5 110.56	NYUUUUU UNNUUUUUU
AK7NPA0375 D 6 SO CENTRAL	GULKANA RIVER LOWER VALDEZ-CHIT- UNDEVELOPED GULKANA B-3.	GULKANA RIVER	62 34.9 145 29.0 1850	H IS 2760.0	50.0 0 231.7	0 9000 9000	0 42000 42000	4713.4 112.22	NYUUUUU UNNUUUUUU
AK7NPA0376 D 5 SO CENTRAL	GULKANA RIVER WEST VALDEZ-CHIT- UNDEVELOPED GULKANA C-5.	W FORK GULKAN	62 34.9 146 4.9 398	H IS 607.0	80.0 0 191.8	0 14000 14000	0 69000 69000	5700.2 82.612	NYUUUUU UNNUUUUUU
AK7NPA0377 I 5 SO CENTRAL	GULKANA RIVER VALDEZ-CHIT- UNDEVELOPED GULKANA C-4.	GULKANA RIVER	62 34.9 145 56.0 575	H IS 856.0	200.0 0 404.5	0 34000 34000	0 164000 164000	10597 64.619	NYUUUUU UNNUUUUUU

Project Listing(continued)

SITE ID / DEP CODE ACTV INV / GEOG. AREA	PROJECT NAME / PRIMARY CO. / OWNER / MAP REFERENCE	NAME OF STREAM	LATITUDE (D M.M) / LONGITUDE (D M.M) / DR.AREA (SQ.MI)	PROJ.PURP. / STATUS / AVE. Q (CFS)	DAM HT (FT) / TOT. STOR (AC FT) / PWR. HD. (FT)	EXIST.CAP. (KW) / INC. CAP. (KW) / TOT. CAP. (KW)	EXIST.ENRG (MWH) / INC.ENERGY (MWH) / TOT.ENERGY (MWH)	ANUL. COST (1000 $) / ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE / SOCIAL IMPACT CODE
AK6NPA0379	KOTSINA RIVER		61 38.0	H	825.0	0	0	43085	YNUUUUU
I 5	VALDEZ-CHIT-	KATSINA RIVER	144 11.0	IS	0	28000	133000	323.94	
SO CENTRAL	UNDEVELOPED		209	607.0	523.4	28000	133000		UNNUUUUUU
	VALDEZ C-1.								
AK7NPA0380	MCCLURE BAY		60 33.9	H	25.0	0	0	1855.5	NNUUUUU
I 5	VALDEZ-CHIT-	HANLEY CREEK	148 10.3	IS	0	8000	36300	51.117	
SO CENTRAL	UNDEVELOPED		71	184.0	296.7	8000	36300		UNNUUUUUU
	SEWARD C-4								
AK6NPA0381	NELCHINA RIVER		62 0.3	H	290.0	0	0	11202	NYUUUUU
I 5	VALDEZ-CHIT-	NELCHINA RIVE	146 38.9	IS	0	45000	219000	51.154	
SO CENTRAL	UNDEVELOPED		820	1297.0	284.7	45000	219000		UNNUUUUUU
	GULKANA A-4								
AK6NPA0382	SANFORD		62 19.9	H	340.0	0	0	22085	YNUUUUU
I 5	VALDEZ-CHIT-	COPPER RIVER	145 21.0	IS	0	80000	385000	57.366	
SO CENTRAL	UNDEVELOPED		3365	5106.0	177.8	80000	385000		UNNUUUUUU
	GULKANA B-3.								
AK7NPA0383	SILVER LAKE		60 56.0	H	100.0	0	0	3165.5	NNUUUUU
I 5	VALDEZ-CHIT-	DUCK RIVER	146 19.9	IS	0	10000	48000	65.948	
SO CENTRAL	UNDEVELOPED		25	248.0	346.0	10000	48000		UNNUUUUUU
	CORDOVA D-7.								
AK7NPA0384	SOLOMON GULCH		61 30.9	H	10.0	0	0	1662.1	NNNNNUU
I 2	VALDEZ-CHIT-	SOLOMON GULCH	146 15.9	IS	0	12000	65000	25.571	
SO CENTRAL	UNDEVELOPED		18	138.0	607.3	12000	65000		NNNNYUUYY
	VALDEZ A-7								
AK7NPA0385	SUMMIT LAKE		63 4.9	H	5.0	0	0	2403.7	NYUUUUU
I 5	VALDEZ-CHIT-	GULKANA RIVER	145 32.0	IS	0	8000	36000	66.771	
SO CENTRAL	UNDEVELOPED		83	121.0	500.0	8000	36000		UNNUUUUUU
	MT HAYES A-4								
AK6NPA0386	TAZLINA		62 0.9	H	300.0	0	0	15286	NYUUUUU
I 6	VALDEZ-CHIT-	TAZLINA RIVER	146 8.9	IS	900000	104000	503000	30.391	
SO CENTRAL	UNDEVELOPED		1970	3174.0	272.7	104000	503000		UYNUUUUUU
	GULKANA A-5.								
AK7NPA0387	TOLSONA CREEK		62 4.9	H	250.0	0	0	14045	NNUUUUU
I 5	VALDEZ-CHIT-	TOLSONA CREEK	145 57.9	IS	0	11000	53000	265. 1	
SO CENTRAL	UNDEVELOPED		174	276.0	459.5	11000	53000		UNNUUUUUU
	GULKANA A-4								

Project Listing(continued)

SITE ID / DEP CODE, ACTV INV / GEOG. AREA	PROJECT NAME / PRIMARY CO. -NAME OF STREAM / OWNER / MAP REFERENCE	LATITUDE (D M.M) / LONGITUDE (D M.M) / DR.AREA (SQ.MI)	PROJ.PURP. / STATUS / AVE. Q (CFS)	DAM HT (FT) / TOT. STOR (AC FT) / PWR. HD. (FT)	EXIST.CAP. (KW) / INC. CAP. (KW) / TOT. CAP. (KW)	EXIST.ENRG (MWH) / INC.ENERGY (MWH) / TOT.ENERGY (MWH)	ANUL. COST (1000 $) / ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE / SOCIAL IMPACT CODE
AK6NPA0392	CHUILNAK RIVER UPPER	62 46.9	H	145.0	0	0	4809.2	YNUUUUU
I 5	WADE HAMPTON ATCHUILNK RIV	161 26.9	IS	0	2000	11000	437.20	
SOUTHWEST	UNDEVELOPED	162	193.0	102.8	2000	11000		UNNUUUUNU
	HOLY CROSS D-5							
AK7NPA0310	THOMAS BAY	57 3.3	H	3.0	0	0	4016.4	NNNNNNN
I 2	WRANGELL PET CASCADE CREEK	132 45.2	IS	0	50000	217417	18.473	
SOUTHEAST	UNDEVELOPED	18	226.0	1443.5	50000	217417		NNNNYYYYY
	SUMDUM A-2 A-3							
AK7NPA0412	AARON	56 22.9	H	100.0	0	0	3386.9	NNUUUUU
I 5	WRANGELL-PET AARON CREEK	131 55.0	IS	76000	12000	58000	58.396	
SOUTHEAST	UNDEVELOPED	94	1100.0	117.8	12000	58000		UNNUUUUUU
	BRADFIELD CANAL C-6.							
AK7NPA0413	ANAN CREEK	56 10.0	H	169.0	0	0	4646.7	NNUUUUU
I 5	WRANGELL-PET ANAN CREEK	131 52.1	IS	164000	7000	33000	140.81	
SOUTHEAST	UNDEVELOPED	27	276.0	299.7	7000	33000		UNNUUUUUU
	BRADFIELD CANAL A-6.							
AK6NPA0414	ANITA	56 15.5	H	68.0	0	0	772.64	NNUUUUU
I 2	WRANGELL-PET ZIMOVIA STRAI	132 26.5	IS	15500	3230	14150	54.603	
SOUTHEAST	UNDEVELOPED	2	27.0	1005.9	3230	14150		UNNUUUUUU
	PETERSBURG B-2.							
AK6NPA0415	BRADFIELD RIVER NORTH	56 19.9	H	150.0	0	0	8544.5	NNUUUUU
I 5	WRANGELL-PET N BRADFIELD R	131 22.0	IS	0	27000	131000	65.225	
SOUTHEAST	UNDEVELOPED	150	1659.0	156.8	27000	131000		UNNUUUUUU
	BRADFIELD CANAL B-5							
AK7NPA0416	BURNETT LAKE	56 5.9	H	35.0	0	0	874.60	NNUUUUU
I 5	WRANGELL-PET BURNETT CREEK	132 27.9	IS	0	3000	12290	71.164	
SOUTHEAST	UNDEVELOPED	7	80.0	229.7	3000	12290		UNNUUUUUU
	PETERSBURG A-2.							
AK4NPA2605	CRITTENDEN CREEK	56 30.0	H	10.0	0	0	926.85	NNUUUUU
I 5	WRANGELL-PET CRITTENDEN CR	132 15.1	IS	0	1850	8128	114. 3	
SOUTHEAST	UNDEVELOPED	10	66.0	119.8	1850	8128		UNNUUUUUU
	PETERSBURG B-1.							
AKJNPA0423	CRYSTAL LAKE	56 35.9	H	25.0	2400	9800	150.41	NNUUUUU
I 5	WRANGELL-PET BLIND RIVER	132 48.0	OP	6860	1400	0	0	
SOUTHEAST	CITY OF PETERSBURG	2	16.0	1200.0	3800	6800		UNNUUUUUU
	PETERSBURG C-3							

Project Listing(continued)

SITE ID / DEP CODE ACTV INV / GEOG. AREA	PROJECT NAME / PRIMARY CO. -NAME OF STREAM / OWNER / MAP REFERENCE	LATITUDE (D M.M) / LONGITUDE (D M.M) / DR.AREA (SQ.MI)	PROJ.PURP. / STATUS / AVE. Q (CFS)	DAM HT (FT) / TOT. STOR (AC FT) / PWR. HD. (FT)	EXIST.CAP. (KW) / INC. CAP. (KW) / TOT. CAP. (KW)	EXIST.ENRG (MWH) / INC.ENERGY (MWH) / TOT.ENERGY (MWH)	ANUL. COST (1000 $) / ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE / SOCIAL IMPACT CODE
AK7NPA0417	FALLS LAKE	57 1.1	H	50.0	0	0	3458.6	NNUUUUU
I 2	WRANGELL-PET CASCADE CREEK	132 45.1	IS	0	44000	190000	18.203	
SOUTHEAST	UNDEVELOPED	20	220.0	906.0	44000	190000		UNNUUUUUU
	SUMDUM A-3.							
AK7NPA0418	FARRAGUT RIVER	57 28.0	H	100.0	0	0	6156.3	NNUUUUU
I 6	WRANGELL-PET FARRAGUT RIVE	132 57.9	IS	0	37000	163000	37.769	
SOUTHEAST	UNDEVELOPED	64	662.0	492.5	37000	163000		UNNUUUUUU
	SUMDUM A-3.							
AK6NPA0419	GOAT	56 38.0	H	65.0	0	0	2586.0	NNUUUUU
I 6	WRANGELL-PET GOAT CREEK	132 0.0	IS	0	20000	87000	29.725	
SOUTHEAST	UNDEVELOPED	14	155.0	1054.9	20000	87000		UNNUUUUUU
	BRADFIELD CANAL C-6.							
AK7NPA0301	HARDING RIVER	56 16.1	H	190.0	0	0	5137.6	NNUUUUU
I 2	WRANGELL-PET HARDING RIVER	131 38.9	IS	0	18000	85000	60.443	
SOUTHEAST	UNDEVELOPED	63	725.0	259.7	18000	85000		UNNUUUUUU
	BRADFIELD CANAL A-5							
AK6NPA0420	HOUGHTON	57 23.0	H	200.0	0	0	4803.3	NNUUUUU
I 6	WRANGELL-PET NO NAME SE AK	133 8.9	IS	0	31000	136000	35.318	
SOUTHEAST	UNDEVELOPED	39	511.0	456.5	31000	136000		UNNUUUUUU
	SUMDUM B-3,B-4.							
AK7NPA0421	KATETE RIVER	56 32.9	H	125.0	0	0	5021.3	NNUUUUU
I 5	WRANGELL-PET KATETE RIVER	131 45.9	IS	0	21000	99000	50.720	
SOUTHEAST	UNDEVELOPED	73	792.0	248.7	21000	99000		UNNUUUUUU
	BRADFIELD CANAL C-6.							
AKNNPA0424	KEKU	56 44.1	H	5.0	30	120	0	NNUUUUU
I 4	WRANGELL-PET KEKU CREEK	133 41.9	OP	0	0	0	0	
SOUTHEAST	KEKU CANNING CO.	8	45.0	127.0	30	120		UNNUUUUUU
	PETERSBURG C-6							
AK6NPA0070	KUNK LAKE	56 17.1	H	110.0	0	0	1235.4	
I 5	WRANGELL-PET KUNK CREEK	132 23.2	IS	35150	2260	9900	124.79	
SOUTHEAST	UNDEVELOPED	8	74.0	309.6	2260	9900		
	PETERSBURG B-2.							
AK6NPA0394	MARTEN CREEK	56 16.9	H	15.0	0	0	816.46	NNUUUUU
I 6	WRANGELL-PET MARTEN CREEK	131 51.0	IS	0	4000	17000	48. 27	
SOUTHEAST	UNDEVELOPED	3	32.0	834.1	4000	17000		UNNUUUUUU
	BRADFIELD CANAL B-6							

Project Listing(continued)

SITE ID DEP CODE / ACTV INV GEOG. AREA	PROJECT NAME PRIMARY CO. -NAME OF STREAM OWNER MAP REFERENCE	LATITUDE (D M.M) LONGITUDE (D M.M) DR.AREA (SQ.MI)	PROJ.PURP. STATUS AVE. Q (CFS)	DAM HT (FT) TOT. STOR (AC FT) PWR. HD. (FT)	EXIST.CAP. (KW) INC. CAP. (KW) TOT. CAP. (KW)	EXIST.ENRG (MWH) INC.ENERGY (MWH) TOT.ENERGY (MWH)	ANUL. COST (1000 $) ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE SOCIAL IMPACT CODE
AK7NPA0396 I 5 SOUTHEAST	MCHENRY LAKE WRANGELL-PET MCHENRY CREEK UNDEVELOPED PETERSBURG A-2	56 3.3 132 20.2 13	H IS 160.0	50.0 0 299.7	0 5000 5000	0 21790 21790	1198.3 54.994	NNUUUUU UNNUUUUUU
AK6NPA0397 I 6 SOUTHEAST	MENEFEE LAKE WRANGELL-PET MENEFEE CASCA UNDEVELOPED PETERSBURG A-1	56 3.9 132 12.9 4	H IS 42.0	70.0 0 964.0	0 6000 6000	0 25000 25000	1151.1 46. 47	NNUUUUU UNNUUUUUU
AK7NPA0398 I 5 SOUTHEAST	NAVY LAKE WRANGELL-PET NAVY CREEK UNDEVELOPED PETERSBURG A-4	56 4.1 132 25.3 7	H IS -36.9	30.0 0 219.7	0 1200 1200	0 5400 5400	853.59 158. 7	NNUUUUU UNNUUUUUU
AK7NPA0399 I 5 SOUTHEAST	OLIVE LAKE WRANGELL-PET OLIVE CREEK UNDEVELOPED PETERSBURG B-2	56 11.2 132 16.9 4	H IS -24.6	30.0 0 269.7	0 1000 1000	0 4421 4421	586.33 132.62	NNUUUUU UNNUUUUUU
AK7NPA0400 I 2 SOUTHEAST	RUTH LAKE WRANGELL-PET DELT CREEK UNDEVELOPED PETERSBURG D-3.	56 59.0 132 45.0 8	H IS 81.0	210.0 0 1447.5	0 13000 13000	0 63000 63000	2873.6 45.613	NNUUUUU UNNUUUUUU
AK7NPA0401 I 2 SOUTHEAST	SCENERY CREEK WRANGELL-PET SCENERY CREEK UNDEVELOPED SUMDUM A-2,A-3.	57 4.9 132 41.9 21	H IS 202.8	10.0 0 619.3	0 15000 15000	0 67000 67000	2280.7 34. 41	NNUUUUU UNNUUUUUU
AK6NPA0402 I 6 SOUTHEAST	STIKINE RIVER WRANGELL-PET STIKINE RIVER UNDEVELOPED PETERSBURG C-1,D-1 BRADFIELD	56 42.0 132 11.9 20000	H IS 62158.0	350.0 0 290.7	0 2260000 2260000	0 9900000 9900000	129956 13.126	NYUUUUU UNNUUUUUU
AK7NPA0403 I 6 SOUTHEAST	SUNRISE LAKE WRANGELL-PET UNNAMED UNDEVELOPED PETERSBURG C-2.	56 24.0 132 29.0 1	H IS 25.0	25.0 0 1898.1	0 5000 5000	0 25298 25298	814.23 32.185	NNUUUUU UNNUUUUUU
AK7NPA0405 I 5 SOUTHEAST	THOMS LAKE WRANGELL-PET THOMS CREEK UNDEVELOPED PETERSBURG A-1.	56 14.0 132 15.0 13	H IS -93.1	20.0 0 229.7	0 3000 3000	0 14255 14255	1282.6 89.979	NNUUUUU UNNUUUUUU

Project Listing(continued)

SITE ID	PROJECT NAME	LATITUDE	PROJ.PURP.	DAM HT	EXIST.CAP.	EXIST.ENRG	ANUL. COST	ENVIRONMENTAL
	PRIMARY CO. -NAME OF STREAM	LONGITUDE	STATUS	TOT. STOR	INC. CAP.	INC.ENERGY	ENERGY COST	IMPACT CODE
DEP ACTV	OWNER	DR.AREA	AVE. Q	PWR. HD.	TOT. CAP.	TOT.ENERGY		
CODE INV	MAP REFERENCE	(D M.M)		(FT)	(KW)	(MWH)	(1000 $)	
		(D M.M)		(AC FT)	(KW)	(MWH)	($/MWH)	SOCIAL
GEOG. AREA		(SQ.MI)	(CFS)	(FT)	(KW)	(MWH)		IMPACT CODE
AK7NPA0406	TOM CREEK	56 12.4	H	50.0	0	0	1801.0	NNUUUUU
I 6	WRANGELL-PET TOM CREEK	131 40.3	IS	0	8500	37467	48. 70	
SOUTHEAST	UNDEVELOPED	17	-148.1	379.6	8500	37467		UNNUUUUUU
	BRADFIELD CANAL B-6.							
AK7NPA0407	TOWERS CREEK	56 51.9	H	200.0	0	0	5435.2	NNUUUUU
I 5	WRANGELL-PET TOWERS CREEK	133 26.0	IS	0	13000	64000	84.926	
SOUTHEAST	UNDEVELOPED	81	414.0	258.7	13000	64000		UNNUUUUUU
	PETERSBURG D-5.							
AK7NPA0408	TYEE CREEK	56 12.0	H	100.0	0	0	3678.2	NNUUUUU
I 2	WRANGELL-PET TYEE CREEK	131 33.0	IS	105000	30000	132940	27.668	
SOUTHEAST	UNDEVELOPED	14	163.0	1356.6	30000	132940		UNNUUUUUU
	BRADFIELD CANAL A-5.							
AK7NPA0409	VIRGINIA LAKE	56 28.4	H	130.0	0	0	2854.2	NNUUUUU
I 5	WRANGELL-PET MILL CREEK EA	132 10.0	IS	0	300	1338	2133.2	
SOUTHEAST	UNDEVELOPED	1	-13.4	149.8	300	1338		UNNUUUUUU
	PETERSBURG B-1.							
AK6NPA0410	WHITE RIVER	56 13.0	H	40.0	0	0	3387.8	NNUUUUU
I 6	WRANGELL-PET WHITE RIVER	131 30.0	IS	0	26000	116440	29. 95	
SOUTHEAST	UNDEVELOPED	43	530.0	329.6	26000	116440		UNNUUUUUU
	BRADFIELD CANAL B-5.							
AK7NPA0411	WILKES RANGE	56 43.0	H	25.0	0	0	590.20	NYUUUUU
I 5	WRANGELL-PET STIKINE RIVER	132 26.0	IS	0	2500	11371	51.904	
SOUTHEAST	UNDEVELOPED	1	-12.2	1398.6	2500	11371		UNNUUUUUU
	PETERSBURG C-2.							
AK6NPA0425	ALATNA RIVER	66 33.9	H	130.0	0	0	21967	NYUUUUU
I 5	YUKON-KOYUKU ALATNA RIVER	152 46.9	IS	2397000	36000	175000	125.52	
YUKON	UNDEVELOPED	2860	2760.0	108.8	36000	175000		UNNUUUUYU
	HUGHES C-1.							
AK7NPA0426	ALATNA RIVER UPPER	67 15.0	H	200.0	0	0	10725	YNUUUUU
I 5	YUKON-KOYUKU ALATNA RIVER	153 31.9	IS	3446000	25000	123000	87.196	
YUKON	UNDEVELOPED	1325	1829.0	157.8	25000	123000		UNNUUUNNU
	SURVEY PASS							
AK6NPA0427	BROWNE	64 11.0	H	230.0	0	0	27731	NNUUUUU
I 2	YUKON-KOYUKU NENANA RIVER	149 15.0	IS	0	200000	566000	48.995	
YUKON	UNDEVELOPED	2450	4692.0	206.7	200000	566000		UYYUNNNNN
	FAIRBANKS A-5.							

Project Listing(continued)

SITE ID / DEP CODE ACTV INV / GEOG. AREA	PROJECT NAME / PRIMARY CO. -NAME OF STREAM / OWNER / MAP REFERENCE	LATITUDE / LONGITUDE / DR.AREA (D M.M) (D M.M) (SQ.MI)	PROJ.PURP. / STATUS / AVE. Q (CFS)	DAM HT / TOT. STOR / PWR. HD. (FT) (AC FT) (FT)	EXIST.CAP. / INC. CAP. / TOT. CAP. (KW) (KW) (KW)	EXIST.ENRG / INC.ENERGY / TOT.ENERGY (MWH) (MWH) (MWH)	ANUL. COST / ENERGY COST (1000 $) ($/MWH)	ENVIRONMENTAL IMPACT CODE / SOCIAL IMPACT CODE
AK6NPA2611	BRUSKANSNA	63 24.0	H	275.0	0	0	7626.1	NNUUUUU
D 5	YUKON-KOYUKU NENANA RIVER	148 30.0	IS	0	36000	160000	47.663	
YUKON	UNDEVELOPED	650	1139.0	211.7	36000	160000		UYYUNNYYN
	HEALY B-4.							
AK6NPA0428	CARLO	63 40.0	H	205.0	0	0	5478.5	YNUUUUU
D 5	YUKON-KOYUKU NENANA RIVER	148 48.9	IS	0	30000	840000	6.5220	
YUKON	UNDEVELOPED	650	1141.0	211.7	30000	840000		UNNUUUUNU
	HEALY C-4.							
AK6NPA2612	DULBI	65 24.0	H	120.0	0	0	44218	YNUUUUU
I 5	YUKON-KOYUKU KOYUKUK	156 23.9	IS	0	244000	1070000	41.326	
YUKON	UNDEVELOPED	25700	26500.0	67.9	244000	1070000		UNNUUUUYU
	KANTEEL RIVER B-1.							
AK6NPA0429	FRY ISLAND	65 43.7	H	70.0	0	0	25650	YNUUUUU
I 5	YUKON-KOYUKU KOYUKUK RIVER	154 56.3	IS	0	114000	622000	41.238	
YUKON	UNDEVELOPED	19950	19320.0	53.9	114000	622000		UNNUUUUNU
	MELOZITNA D-4.							
AK6NPA0430	HEALY	63 48.9	H	296.0	0	0	9943.2	YNUUUUU
D 6	YUKON-KOYUKU NENANA RIVER	148 56.9	IS	0	133000	581000	17.114	
YUKON	UNDEVELOPED	1900	3695.0	290.7	133000	581000		UNNUUUUNU
	HEALY D-4.							
AK6NPA2614	HUGHES	66 0.0	H	100.0	0	0	22524	NNYYYUY
D 5	YUKON-KOYUKU KOYUKUK RIVER	154 16.0	IS	1140000	110000	482000	46.730	
YUKON	UNDEVELOPED	18700	16900.0	48.9	110000	482000		UYNUNNNYY
	HUGHES A-3.							
AK7NPA2622	JACK RIVER	63 19.7	H	385.0	0	0	20034	NNUUUUU
I 5	YUKON-KOYUKU JACK RIVER	148 43.3	IS	179000	28750	125000	160.27	
YUKON	UNDEVELOPED	135	405.0	466.5	28750	125000		UNNUYYYYY
	HEALY B-4.							
AK6NPA2623	JACK WHITE	66 54.0	H	150.0	0	0	8479.8	YNUUUUU
I 6	YUKON-KOYUKU KOYUKUK RIVER	152 25.0	IS	0	65000	315000	26.920	
YUKON	UNDEVELOPED	6700	4140.0	135.8	65000	315000		UYYUUUNYY
	BETTLES							
AK6NPA2624	JIM RIVER	66 46.8	H	110.0	0	0	2432.0	YNUUUUU
I 5	YUKON-KOYUKU JIM RIVER	151 11.2	IS	0	9000	43000	56.559	
YUKON	UNDEVELOPED	470	442.0	161.8	9000	43000		UNNUUUUUU
	BETTLES D-2.							

Project Listing(continued)

SITE ID DEP CODE / ACTV INV GEOG. AREA	PROJECT NAME PRIMARY CO. -NAME OF STREAM OWNER MAP REFERENCE	LATITUDE (D M.M) LONGITUDE (D M.M) DR.AREA (SQ.MI)	PROJ.PURP. STATUS AVE. Q (CFS)	DAM HT (FT) TOT. STOR (AC FT) PWR. HD. (FT)	EXIST.CAP. (KW) INC. CAP. (KW) TOT. CAP. (KW)	EXIST.ENRG (MWH) INC.ENERGY (MWH) TOT.ENERGY (MWH)	ANUL. COST (1000 $) ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE SOCIAL IMPACT CODE
AK7NPA2625 I 5 YUKON	JOHN RIVER YUKON-KOYUKU JOHN RIVER UNDEVELOPED WISEMAN A-4	67 5.9 151 57.9 2695	H IS 2622.0	365.0 0 799.2	0 31000 31000	0 149000 149000	12413 83.312	NNUUUUU UNNUYYYNY
AK6NPA2616 I 6 YUKON	JUNCTION ISLAND YUKON-KOYUKU TANANA RIVER UNDEVELOPED KANTISHNA D-1.	64 52.8 150 19.9 42500	H IS 34000.0	150.0 0 113.8	0 532000 532000	0 2330000 2330000	103594 44.461	NNUYYUY UYYUNNNYY
AK6NPA2626 I 6 YUKON	KALTAG RIVER YUKON-KOYUKU YUKON RIVER UNDEVELOPED NULATO	64 13.8 158 38.9 296000	H IS 191800.0	120.0 20000000 116.8	0 3000000 3000000	0 13100000 13100000	327701 25. 15	NNUUUUU UNNUUUUUU
AK6NPA2627 I 5 YUKON	KANTISHNA RIVER YUKON-KOYUKU KANTISHNA RIV UNDEVELOPED KANTISHNA RIVER B-1.	64 45.6 150 30.0 5440	H IS 7176.0	115.0 0 94.9	0 82000 82000	0 394000 394000	36324 92.194	NNUUUUU UNNUUUUUU
AK6NPA2617 I 6 YUKON	KANUTI YUKON-KOYUKU KOYUKUK RIVER UNDEVELOPED HUGHES B-2.	66 27.6 153 4.9 18000	H IS 16400.0	200.0 37300000 165.8	0 368000 368000	0 1612000 1612000	23450 14.547	NNUYYUY UNNUUNNYY
AK6NPA2629 I 6 YUKON	MCKINLEY RIVER YUKON-KOYUKU MCKINLEY RIVE UNDEVELOPED MT MCKINLEY B-3	63 51.5 151 33.0 710	H IS 1255.0	320.0 0 296.7	0 42000 42000	0 201000 201000	8597.5 42.774	YNUUUUU UNNUUUUNU
AK6NPA2618 I 5 YUKON	MELOZITNA YUKON-KOYUKU MELOZITNA RIV UNDEVELOPED RUBY D-6.	64 50.9 155 34.9 2659	H IS 1932.0	350.0 0 269.7	0 64000 64000	0 282000 282000	28732 101.88	YNUUUUU UNNNYYYYY
AK6NPA2630 D 5 YUKON	MELOZITNA RIVER YUKON-KOYUKU MELOZITNA RIV UNDEVELOPED MELOZITNA B-4	65 15.0 154 45.0 2020	H IS 1518.0	135.0 1300000 128.8	0 13000 13000	0 117000 117000	6975.8 59.622	NNUUUUU UNNUYYYYY
AK6NPA2632 I 5 YUKON	NOWITNA RIVER YUKON-KOYUKU NOWITNA RIVER UNDEVELOPED RUBY B-2.	64 22.8 153 37.0 2570	H IS 3080.0	200.0 2200000 179.8	0 58000 58000	0 280000 280000	8295.4 29.626	YNUUUUU UNNUUUUYU

Project Listing(continued)

SITE ID / DEP ACTV / CODE INV / GEOG. AREA	PROJECT NAME / PRIMARY CO. -NAME OF STREAM / OWNER / MAP REFERENCE	LATITUDE (D M.M) / LONGITUDE (D M.M) / DR.AREA (SQ.MI)	PROJ.PURP. / STATUS / AVE. Q (CFS)	DAM HT (FT) / TOT. STOR (AC FT) / PWR. HD. (FT)	EXIST.CAP. (KW) / INC. CAP. (KW) / TOT. CAP. (KW)	EXIST.ENRG (MWH) / INC.ENERGY (MWH) / TOT.ENERGY (MWH)	ANUL. COST (1000 $) / ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE / SOCIAL IMPACT CODE
AK6NPA2620	RAMPART	65 19.7	H	565.0	0	0	845203	NYUUUUU
I 6	YUKON-KOYUKU YUKON RIVER	151 1.0	IS	52000000	5040000	34200000	24.713	
YUKON	UNDEVELOPED	200000	112000.0	444.5	5040000	34200000		UNNUNUUNU
	TANANA B-3.							
AK6NPA2621	RUBY	64 45.6	H	80.0	0	0	159812	YNUUUUU
D 6	YUKON-KOYUKU YUKON RIVER	155 28.0	IS	0	460000	6400000	24.970	
YUKON	UNDEVELOPED	256000	150000.0	71.9	460000	6400000		UNNUNUUNU
	RUBY D-5.							
AK6NPA0431	TEKLANIKA	63 59.0	H	470.0	0	0	16125	YNUUUUU
I 5	YUKON-KOYUKU TEKLANIKA RIV	149 33.0	IS	275000	57000	272000	59.285	
YUKON	UNDEVELOPED	520	690.0	456.5	57000	272000		UNNUUUNYN
	HEALY D-6.							
AK6NPA0432	TOTATLANIKA RIVER	64 13.3	H	430.0	0	0	9702.7	NNUUUUU
I 5	YUKON-KOYUKU TOTATLANIKA R	148 44.3	IS	0	24000	114000	85.112	
YUKON	UNDEVELOPED	250	440.0	419.5	24000	114000		UNNUUUUUU
	FAIRBANKS A-4.							
AK6NPA0433	VACHON ISLAND	64 50.0	H	120.0	0	0	60163	NNYYUUY
I 6	YUKON-KOYUKU TANANA RIVER	152 49.9	IS	0	426000	2050000	29.348	
YUKON	UNDEVELOPED	44500	35880.0	95.9	426000	2050000		UNNUNNUYU
	KANTISHNA RIVER D-3.							
AK6NPA0434	WALKER CREEK	63 57.0	H	200.0	0	0	22970	NNUUUUU
I 5	YUKON-KOYUKU NENANA RIVER	149 10.0	IS	0	35000	166000	138.37	
YUKON	UNDEVELOPED	2330	4554.0	165.8	35000	166000		UYYUNUUNU
	FAIRBANKS A-5.							
AK6NPA0435	YANERT NO 2	63 37.9	H	250.0	0	0	17231	YNUUUUU
D 5	YUKON-KOYUKU NENANA RIVER	148 48.9	IS	0	62000	298000	57.824	
YUKON	UNDEVELOPED	1190	2305.0	231.7	62000	298000		UNNUUUUYU
	HEALY C-4.							

Appendix B
PUBLIC REVIEW COMMENTS

Federal

Alaska Power Administration B-1
U.S. Fish and Wildlife Service B-3

State

Alaska Power Authority B-4

Department Of Energy
Alaska Power Administration
P.O. Box 50
Juneau, Alaska 99802

February 12, 1981

Mr. Tom White (NPDPL)
North Pacific Division
Corps of Engineers
P.O. Box 2870
Portland, OR 97208

Dear Mr. White:

Here are our comments on the National Hydropower Study for Alaska. Many of our comments have already been incorporated into the draft report through continuing coordination with the Alaska District Office.

This draft report is much improved over a previous draft we reviewed and appears to adequately address the marketability aspects of the identified more desirable projects.

We realize that a study of this type, which is based on criteria developed at the National level, will in some cases cause discrepancies in results. This particularly becomes apparent when comparing results from the National Hydro Study with previously published cost data for some Alaska projects. The results for the Chakachamna Project, for example, indicate a much lower cost of energy than the Upper Susitna Project. This is a serious misrepresentation, not supported by previous studies. We suggest a "qualifier" be included in your report that would point out these discrepancies and further caution use of the cost figures unless verified by other studies.

We note that in this draft two projects, Tazimina and Grant, have been added to the list of 59 potential hydropower sites. These sites were not included in our marketability study. The inclusion of these two sites increases the power needs that can be met in the Southwest region from 39 percent to 100 percent. This also affects table 7-2 on page 72. A copy of the revised table is enclosed.

We are enclosing a marked up copy of your list of 59 sites with some changes in project ownership based on local knowledge, revision of energy and capacity figures for the Snettisham Project, and a suggested deletion of the Gold Creek and Treadwell Ditch projects (#34 and #35) along with one of the two plans of development for the Thomas Bay Project.

We look forward to seeing the final report.

Sincerely,

Robert J. Cross
Administrator

Enclosures

cc: Colonel Lee Nunn, Corps of Engineers w/enclosures

IN REPLY REFER TO:

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1011 E. TUDOR RD.
ANCHORAGE, ALASKA 99503
(907) 276-3800

2 MAR 1981

North Pacific Division
Corps of Engineers
Attn: Tom White
P.O. Box 2870
Portland, Oregon 97208

Dear Mr. White:

We have reviewed the draft report on the National Hydropower Study for the Alaska Region and have the following comments:

In 1978, we responded to CH_2M Hill concerning their "Review of South Central Alaska Hydropower Potential - Anchorage Area" and recommended several sites as unacceptable for hydropower development because of their important fishery resources. Four of these sites (Skwentna, Yentna, Beluga Upper and Coffee) are included in this draft report as potential hydropower projects and identified for detailed study. In recognition of identified fishery resource values, we question the merit of continuing to list these areas as sites to be studied for hydropower development unless it has already been determined that no less environmentally damaging alternative energy sources exist. If so, this should be indicated in the report.

Our comments to CH_2M Hill were for projects in southcentral Alaska only. Therefore, we have not previously provided comments on the potential hydropower sites in southwest or southeast Alaska. In southwest Alaska the three largest projects presented in your report are: Kisaralik, Tazimina and Grant Lake. Development of these projects would definitely impact important fishery resources. In southeast Alaska, Anita (Zimovia Strait), Harding River, Ketchikan Creek and Mellen Lake (Reynolds Creek) are areas which would be very sensitive to hydropower developments. We would recommend that all of the aforementioned sites be eliminated from further consideration until all other alternatives have been investigated.

Sincerely,

Le Roy W Sowl

DEPUTY Regional Director

ALASKA POWER AUTHORITY

333 WEST 4th AVENUE - SUITE 31 - ANCHORAGE, ALASKA 99501 Phone: (907) 277-7641
(907) 276-2715

January 16, 1981

Alaska District, Corps of Engineers
ATTN: NPAEN-PL-R (Steve Boardman)
Post Office Box 7002
Anchorage, Alaska 99510

Dear Mr. Boardman:

This letter is in response to your request for comments on the National Hydropower Study, Volume XXIV, Alaska Region, dated December 1980.

The list of projects under study or construction on page 30 should be augmented by the addition of:

Haines and Skagway	West Creek	5 MW
Bristol Bay	Tazimina River	18 MW

Both projects are under study by the Power Authority. Two additional corrections on this page relate to the communities served. The market for Tyee is Wrangell and Petersburg, while that for Black Bear Lake will be Klawock, Craig and Hydaburg. Finally, it appears that the capacity of Port Lions is misstated.

My primary concern with the study is the degree of consistency in project cost estimates. You suggest on page 56 that computer-aided cost estimates were overridden, for certain specific projects, by the results of detailed studies. This has the potential for creating anomalies that may prove very misleading. A case in point is the Chackachamna Project. Working back from your annual cost calculations on the computerized form, we calculate an investment cost of $267 million for Chackachamna. I surmise that this was a computer generated estimate, because it is much lower than any detailed study would show. In fact, following is a quote from the March 1962 Status Report of the Bureau of Reclamation on the Chakachamna Project:

> "The estimated construction cost of the plan of development selected for this report is $325,239,000, based on <u>October 1, 1961 price levels</u>." (Emphasis added.)

The danger here is that the reader of your report will be led to believe that the cost per kilowatt-hour for Chackachamna is 12 mills while that for Watana is 18 mills.

I realize the difficulty you must have faced in having the results of detailed studies in certain cases and nothing but the computer-aided approximate methodology for others. I would request, however, that you take another look at the Chackachamna cost estimate and resultant cost of energy. Also, I suggest you put a strongly worded and prominent disclaimer on the estimates of energy cost, explaining that they are very gross. The approach used may be appropriate for broad categorization of feasible and non-feasible projects, but the results should not be indiscriminately used for comparison among projects on the final list.

I think this matter is very important, and I hope you will be able to respond to my comment. Thank you for the opportunity to review the report.

Sincerely,

Eric P. Yould
Executive Director

cc: Robert Cross, Alaska Power Administration
North Pacific Division, COE, ATTN: NPDPL (Tom White)
John Lawrence, Acres, (ATTN: System Generation Planners)

Appendix C
REFERENCES

REFERENCES

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Appendix D

GLOSSARY

Abbreviations

British thermal units	Btu	kilowatt	kW
dollars	$	kilowatt-hours	kWhr
gigawatt	GW	megawatt	MW
gigawatt-hours	GWhr	megawatt-hours	MWhr

AVERAGE LOAD-the hypothetical constant load over a specified time period that would produce the same energy as the actual load would produce for the same period.

BENEFIT-COST RATIO (B/C)-the ratio of the present value of the benefit stream to the present value of the project cost stream computed for comparable price level assumptions.

BENEFITS (ECONOMIC)-the increase in economic value produced by a project, typically represented as a time stream of value produced by the generation of hydroelectric power.

BRITISH THERMAL UNIT (Btu)-the quantity of heat energy required to raise the temperature of 1 pound of water degree Fahrenheit, at sea level.

BUS-an electrical conductor which serves as a common connection for two or more electrical circuits. A bus may be in the form of rigid bars, either circular or rectangular in cross sections, or in form of stranded-conductor overhead cables held under tension.

BUSBAR-an electrical conductor in the form of rigid bars, located in switchyard or powerplants, serving as a common connection for two or more electrical circuits.

CAPACITY-the maximum power output or load for which a turbine-generator, station, or system is rated.

CAPACITY VALUE-that part of the market value of electric power which is assigned to dependable capacity.

COSTS (ECONOMIC)-the stream of value required to produce the project output. In hydro projects this is often limited to the management and construction cost required to develop the powerplant, and the administration, operations, maintenance and replacement costs required to continue the powerplant in service.

CRITICAL STREAMFLOW-the amount of streamflow available for hydroelectric power generation during the most adverse streamflow period.

DEMAND-see LOAD.

DEPENDABLE CAPACITY-the load carrying ability of a hydropower plant under adverse hydrologic conditions for the time interval and period specified of a particular system load.

DIVERSION-the removal of streamflow from its normal water source such as diverting flow from a river for purposes such as power generation or irrigation.

DRAFT TUBE-that section of the turbine water passage which extends from the discharge side of the turbine runner to the downstream extremity of the powerhouse structure.

ENERGY-the capacity for performing work. The electrical energy term generally used is kilowatt-hours and represents power (kilowatts) operating for some time period (hours).

ENERGY VALUE-that part of the market value of electric power which is assigned to energy generated.

FEASIBILITY STUDY-an investigation performed to formulate a hydropower project and definitively assess its desirability for implementation.

FEDERAL ENERGY REGULATORY COMMISSION (FERC)-an agency in the Department of Energy which licenses non-Federal hydropower projects and regulates interstate transfer of electric energy. Formerly the Federal Power Commission (FPC).

FIRM ENERGY-the energy generation ability of a hydropower plant under adverse hydrologic conditions for the time interval and period specified of a particular system load.

FORCED OUTAGE-the shutting down of a generating unit for emergency reasons.

FORCED OUTAGE RATE-the percent of scheduled generating time a unit is unable to generate because of forced outages due to mechanical, electrical or another failure.

FOREBAY-this generally refers to the reservoir area located immediately upstream of a dam or powerhouse.

FOSSIL FUELS-refers to coal, oil, and natural gas.

GENERATOR-a machine which converts mechanical energy into electric energy.

GIGAWATT (GW)-one million kilowatts.

HEAD, GROSS (H)-the difference in elevation between the headwater surface above and the tailwater surface below a hydroelectric powerplant, under specified conditions.

HORSEPOWER-mechanical energy equivalent to 550 ft. lbs. per second of work.

HYDROELECTRIC PLANT OR HYDROPOWER PLANT-an electric power plant in which the turbine-generators are driven by falling water.

IMPOUNDMENTS-bodies of water created by erecting a barrier to flow such as dams and diversion structures.

INSTALLED CAPACITY-the total of the capacities shown on the nameplates of the generating units in a hydropower plant.

INTAKE STRUCTURE-a concrete structure arranged to control the flow of water from a reservoir to the ultimate point of use. This structure usually contains either intake gates, or large valves, for regulating the rate of flow and for shutoff purposes.

KILOWATT (kW)-one thousand watts.

KILOWATT-HOUR (kWh)-the amount of electrical energy involved with a one kilowatt demand over a period of one hour. It is equivalent to 3,413 Btu of heat energy.

LOAD-the amount of power needed to be delivered at a given point on an electric system.

LOAD CURVE-a curve showing power (kilowatts) supplied, plotted against time of occurrence, and illustrating the varying magnitude of the load during the period covered.

LOAD FACTOR-the ratio of the average load during a designated period to the peak or maximum load occurring in that period.

LOW HEAD HYDROPOWER-hydropower that operates with a head of 20 meters (66 feet) or less.

MEGAWATT (MW)-one thousand kilowatts.

MEGAWATT-HOURS (MWh)-one thousand kilowatt-hours.

MULTIPURPOSE RIVER BASIN PROGRAM-programs for the development of rivers with dams and related structures which serve more than one purpose, such as - hydroelectric power, irrigation, water supply, water quality control, and fish and wildlife enhancement.

NUCLEAR POWER-power released from the heat of nuclear reactions, which is converted to electric power by a turbine-generator unit.

OPERATING POLICY (Operating Rule Curves)-the technical operating guide adopted for water resources projects to assure that authorized output of the project is achieved. Usually in the form of charts and graphs of reservoir release rates for various operational situations.

OUTAGE-the period in which a generating unit, transmission line, or other facility, is out of service.

PEAK LOAD-the maximum load in a stated period of time.

PEAKING CAPACITY-the part of a system's capacity which is operated during the hours of highest power demand.

PENSTOCK-a large water conduit which is subjected to high internal pressure and is fully self-supporting.

PLANT FACTOR-ratio of the average load to the installed capacity of the plant, expressed as an annual percentage.

PONDAGE-the amount of water stored behind a hydroelectric dam of relatively small storage capacity used for daily or weekly regulation of the flow of a river.

POWER (ELECTRIC)-the rate of generation or use of electric energy, usually measured in kilowatts.

POWER POOL-two or more electric systems which are interconnected and coordinated to a greater or lesser degree to supply, in the most economical manner, electric power for their combined loads.

PUMPED STORAGE-an arrangement whereby electric power is generated during peak load periods by using water previously pumped into a storage reservoir during off-peak periods.

REALLOCATION-the concept of changing the existing distribution in use of reservoir storage space to a new distribution. Reallocation of flood control storage to power storage would reduce reservoir storage space reserved for temporary storage of flood water and increase the conservation storage available for power operation.

RECONNAISSANCE STUDY-a preliminary feasibility study designed to ascertain whether a feasibility study is warranted.

REVERSIBLE PUMP TURBINE-a Francis type hydraulic turbine which is designed to operate a pump in one direction of rotation, and as a turbine in the opposite direction of rotation. Good efficiencies can be achieved with both modes of operation.

RUNNER BLADES-the propeller like vanes of a hydraulic turbine which convert the kinetic energy of the water into mechanical power.

SECONDARY ENERGY-all hydroelectric energy other than FIRM ENERGY.

SPINNING RESERVE-generating units operating at no load or at partial load with excess capacity readily available to support additional load.

STEAM-ELECTRIC PLANT-a plant in which the prime movers (turbines) connected to the generators are driven by steam.

SURPLUS POWER-generating capacity which is not needed on system at the time it is available.

SYSTEM, ELECTRIC-the physically connected generation, transmission, distribution, and other faciltiies operated as an integral unit under one control, management or operating supervision.

TAILWATER LEVEL-the water level measured in the tailrace area immediately downstream from a hydro plant.

THERMAL PLANT-a generating plant which uses heat to produce electricity. Such plants may burn coal, gas, oil, or use nuclear energy to produce thermal energy.

TRANSMISSION-the act or process of transporting electric energy in bulk.

TURBINE-the part of a generating unit which is spun by the force of water or steam to drive an electric generator. The turbine usually consists of a series of curved vanes or blades on a central spindle.

Impulse Turbines-an impulse turbine is one having one or more free jets discharging into an aerated space and impinging on the buckets of the runner, means of controlling the rate of flow, a housing and a discharge passage. The water supplies energy to the runner in kinetic form.

Reaction Turbine-a reaction turbine is one having a water supply case, a mechanism for controlling the quantity of water and for distributing it equally over the entire runner intake, and a draft tube. The water supplies energy to the runner in kinetic form.

Francis Turbine-a reaction turbine having a runner with a large number of fixed buckets, usually nine or more, to which the water is supplied in a whirling radial direction and can be designed for operating heads ranging from 50 feet to 2,000 feet.

Adjustable-Blade Propeller Turbine (KAPLAN)-a reaction turbine having a runner with a small number of blades, usually four to eight, to which the water is supplied in a whirling axial direction. The blades are angularly adjustable in the hub.

Fixed-Blade Propeller Turbine-a reaction turbine having a runner with a small number of blades, usually four to eight, to which the water is supplied in a whirling axial direction. The blades are rigidly fastened to the hub.

UNIT EFFICIENCY-the combined overall efficiency of a hydraulic turbine and its driven generator.

UPRATING-increasing the generating capacity of a hydropower plant by either replacing existing equipment with new equipment or making improvements to the existing equipment.

WATT-the rate of energy transfer equivalent to one ampere under a pressure of one volt at unity power factor.

WHEELING-transportation of electricity by a utility over its lines for another utility; also includes the receipt from and delivery to another system of like amounts but not necessarily the same energy.

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National Hydroelectric Power Study

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Chapter 1
REGIONAL OBJECTIVES

Currently and in the foreseeable future, the Hawaii region will be almost wholly dependent upon imported petroleum products for generation of power in the public utility system. The purpose of this regional study is to document the role of hydroelectric power in the Hawaii region, both currently and in the foreseeable future. The report will not recommend projects for authorization of construction by the Corps of Engineers. However, the report will present information on those potential projects which should be considered for continued study consistent with the following objectives:

1. Increase the energy self-sufficiency of the region.

2. Assess the physical potential for increasing hydroelectric power capability and generation.

3. Determine the potential for increasing hydroelectric generating capacity by development of new sites and by adding generating facilities to existing water resource projects.

4. Assess the general environmental and socioeconomic impacts of hydroelectric power development.

5. Provide for maximum feasible utilization of the energy potential derived from the region's water resources.

Chapter 2
EXISTING CONDITIONS

2.1 GENERAL AREA DESCRIPTION

For the National Hydroelectric Power Study, the Hawaiian Archipelago constitutes the Hawaii Region. The Hawaiian Archipelago extends some 1,523 miles over the North Pacific Ocean, between the islands of Midway on the west and Hawaii on the east. The archipelago consists of a chain of mountaintop islands, islets, pinnacles and reefs, all rising thousands of feet from the ocean floor. A large part of the Pacific Ocean surrounding Hawaii has depths from 16,000 to 20,000 feet. Except for Midway Island, the archipelago is under the jurisdiction of the State of Hawaii, the 50th State admitted to the Union, the 47th in geographic area and 40th in population. Midway has no potential for hydropower development, so the study area following comprises only the State of Hawaii.

The State's eight principal islands (with their areas in square miles) are Niihau (73), Kauai (553), Oahu (608), Molokai (261), Lanai (140), Kahoolawe (45), Maui (729), and Hawaii (4,038). These islands form a 400-mile-long arc at the southeastern end of the archipelago and comprise more than 99 percent of the region's land area. Of the eight islands, Kahoolawe is barren, uninhabited and under military control; Niihau is privately owned and little developed. The other six islands of Kauai, Oahu, Molokai, Lanai, Maui, and Hawaii, therefore, constitute the principal study area. The island of Oahu, which is the third largest in land area, is the social, cultural, economic, and military center of the State. The study region is shown on Figure 2-1.

The islands and mountains that constitute the Hawaiian Archipelago have been built almost entirely by volcanic activity. Each island is the top of an enormous volcanic mountain, modified by stream and wave erosion and minor amounts of organic growth. The geology is predominantly igneous, with lava basalts and sporadic occurences of pyroclastics comprising the majority of the rock types. The decomposition of lava and pyroclastics results in the residual, lateritic soils found blanketing most of the islands.

Constant erosion has changed the topography of the islands from huge, gently sloping volcanoes to dissected and incisioned cliffs, valleys and basins. The topography of many of the drainage areas is characterized by relatively steep stream courses and steep, rugged basaltic formations. As a result, the streams generally do not meander as they traverse alluvial areas. In areas of the State which are geologically youthful, few if any perennial streams are found. For example, on the island of Hawaii, 710 intermittent streams reach the sea along three-fourths of the coastline, a distance of about 225 miles.

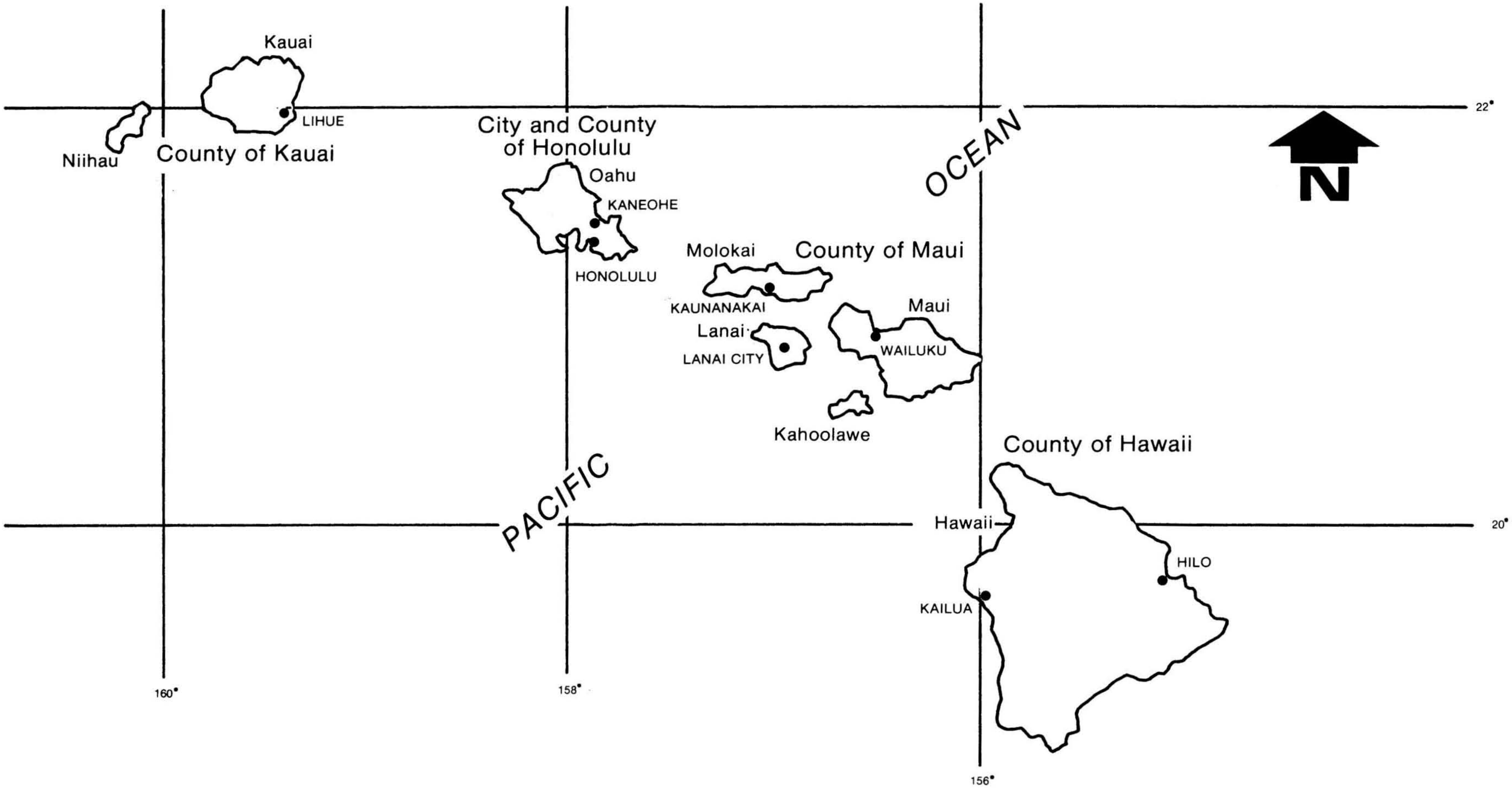

Figure 2-1
LOCATION MAP-STATE OF HAWA II

2.2 CLIMATOLOGY AND HYDROLOGY

In general, the climate of the Hawaiian Islands is characterized by a two-season year (summer and winter), mild and uniform temperature, strikingly marked geographic differences in rainfall, generally humid condition, and by a general dominance of tradewind flow from the northeast. During the five-month summer from May through September, tradewinds prevail 80 to 95 percent of the time. During the seven-month winter from October through April, the prevalence of the tradewinds decreases to 50 to 80 percent. Although the trade-winds produce most of the annual rainfall over the Hawaiian Islands, it is during the absence of these winds that most of the flood-producing rainfall occurs. In particular, storms from the south which are known as "Kona" storms produce the damaging floods in Hawaii. These storms usually occur during the winter months.

Much of the rainfall in Hawaii results from orographic effects of the northeast tradewinds, the most prominent feature of air circulation in the islands. However, major storms are almost always associated with a migratory low pressure area accompanied by widespread heavy rain and southerly winds. In the open ocean, at the latitude of the Hawaiian Islands, the average annual rainfall is approximately 25 inches. The actual average at 70 inches indicates about 45 inches of rainfall is orographically extracted from moisture-bearing air. These effects are evident from the annual rainfall maps, which show the tremendous depths of rainfall deposited in mountainous areas and the large variation in rainfall between the mountain and coastal areas. In many mountainous areas of the State these depths exceed 240 inches. At Mt. Waialeale, on Kauai, the average annual rainfall totals 486 inches.

The average rainfall is often highly variable from one year to another. Even in areas where the rainfall is very high and the monthly averages are all above 10 inches, the rainfall of some months may vary by 200 to 300 percent from one year to another and there may be some months with only 1 or 2 inches of rain. With such a high variability of rainfall, it is inevitable that there are occasional droughts. Drought conditions are prevalent when the winter rain fails. Although such a deficit of winter storms can affect any portion of the State, the impact is severest over the normally dry areas dependent chiefly on these winter rains. In these localities, the small amount of rainfall that occurs during the usually dry summer season is insufficient to prevent severe drought.

Steep streams extending from mountainous rainfall belts to the shoreline are characteristic of the topography and relatively small geographic area of the Hawaiian Islands. There are no large watershed areas with complex stream systems comparable to continental areas, but only relatively small drainage basins, usually consisting of one principal stream with minor tributaries. As most streams have only a few branches generally located in their upper reaches, the water quickly finds its way to the sea. As a result, streamflows are generally very flashy in nature. Minimum flows may consist principally of groundwater seepage and spring discharges. Maximum flows result from heavy rains and reflect the rapid surface runoff typical of Hawaii's mountainous areas.

2.3 ECONOMICS OF AREA

Hawaii is a prosperous state with growing population and economy. Between 1950 and 1978, the total resident population increased by over 79 percent, from 500,000 to 897,000. The gross state product increased tenfold during this same period, from $900 million to $9 billion. The three largest contributors to the State's economy are tourism, Federal expenditures, and agriculture. The bulk of agricultural activity is in the production of sugar and pineapple. The most rapid growth in the past decade has been in the tourist industry. Tourist arrivals increased from 243,216 annually in 1959 to 3,670,309 in 1978. Visitor expenditures have grown by an average of over 17 percent annually since 1959, when they amounted to $109 million. Estimated 1978 visitor expenditures were over $2 billion. While visitor expenditures increased by a factor of 20 over this period, defense expenditures only tripled. The trend in tourist industry growth will probably continue, although at a slower pace, together with the State's economy in general.

Hawaii's locational advantages and climate are apparent to the visitor industry and the military establishment. Its mid-Pacific location also has important trade and finance implications. The island of Oahu has about 81 percent of the population of the State, and includes the major military installations. Oahu also has a considerable agricultural and food processing industry and the largest regional tourist destination area, Waikiki beach. The other islands, sometimes referred to as the Neighbor Islands, do not have as diversified an economic base. In the past their economies have centered on agriculture and attendant food processing but, employment in these two sectors has been on the decline. The growth in the tourist industry, however, has stimulated the Neighbor Islands economies as well as the State's economy.

The 1970 Census recorded a labor force of 346,859 of which 337,595 (49,785 in the military) were employed. Between 1940 and 1970 the number of employed persons almost doubled. During this same period, agricultural employment fell from 55,000 to 13,000. By occupation, one out of every six workers is classified as either professional or technical. Activities in the 1970 employment with large number of workers are services (82,000), government (70,000), retail trade (50,000), and manufacturing (31,000). Labor union membership was estimated at 82,000 in 1970.

From a cursory viewpoint, it may appear that the Hawaiian Islands are insulated from other economies in the mid-Pacific area and should exhibit stable employment. On the contrary, growth in the tourist industry and strategic shifts in military deployment link Hawaii's economy to other Pacific Basin economies and to the global military situation.

Information from U. S. Census of Population reports indicates that the number of employed persons in the State grew at over 2 percent a year during the decade of the 1950's and increased to an annual rate of over 3 percent during the 1960's. This State growth pattern strongly reflects the average annual growth rate of about 3-1/3 percent experienced by the City and County of Honolulu for both decades. The Counties of Hawaii, Maui, and Kauai have had a somewhat different experience. During the decade of the fifties, these counties experienced a continuing decline of employment in the agricultural sector, which resulted mainly from the impact of mechanization. Though this decline in agricultural employment still continues, the development of a significant tourist industry in these counties has expanded employment over the past decade.

2.4 MAJOR ENERGY USERS

Hawaii derives 92 percent of its energy from petroleum. Table 2-1 shows consumption of petroleum in Hawaii by basic industry.

Table 2-1
HAWAII PETROLEUM CONSUMPTION BY BASIC INDUSTRY, 1976

User Category	Percent of Total
Air Transportation	27.4
Ground Transportation	15.6
Water Transportation	3.5
Military Transportation	8.4
Military (Other)	9.2
Industrial/Commercial	14.9
Residential	13.1
Other	7.9
Total	100.0

Source: State Energy Office consultant's unpublished report.

Combined transportation is by far the largest energy consuming industry. Two of Hawaii's largest industries stand out in this table; tourism, which is Hawaii's largest industry, accounts for the majority of the 27 percent consumed by air transportation and a significant portion of the 16 percent used by ground transportation; the military establishment, which is a major industry in Hawaii, accounts for almost 18 percent of the total petroleum consumption. Table 2-2 shows the major civilian energy users in Hawaii. The two largest users, overseas airlines and residents (home and car), consume more than half of the State's energy. One quarter of the State's petroleum consumption is for electricity generation.

In 1976, about half of the State's electrical energy was consumed by residential users. Other major electrical energy users included retail (7.3%), hotel (6.7%), institutions (5%) and manufacturing (4.8%). The consumption of electricity for the State and four major islands is summarized in Table 2-3. As displayed in that table, users on the island of Oahu consumed 85.2 percent of the State's total electricity, while users on the islands of Hawaii, Maui, and Kauai consumed 6.6, 5.5 and 2.7 percent, respectively. Consumption of electricity on the island of Molokai amounts to less than one-half of 1 percent of the State's total and is therefore excluded.

Table 2-2
HAWAII'S CIVILIAN ENERGY USE

(Billion BTU's)

End Users	Direct Deliveries	Electrical Utilities	Civilian and PX Service Sta.	Gas Mfrs. and Distributors	Total	Percent of Total
Overseas airlines	56,128.9	ND	64.0 1/	ND	56,192.9	29.5
Residents: home & car	ND	30,548.7	18,237.0	2,286.0	51,071.7	26.8
Agriculture, incl. process	7,673.0	371.9	160.0	ND	8,204.9	4.3
Overseas waterborne	8,056.4	ND	50.0	ND	8,106.4	4.3
Commercial and industrial	2,636.0	2,941.0	0.0	2,343.0	7,920.0	4.2
Wholesale/retail	ND	4,562.4	1,406.0	ND	5,968.4	3.1
Local airlines	5,349.6	ND	31.0 1/	ND	5,380.6	2.8
Hotel	ND	4,362.7	128.0	ND	4,490.7	2.4
Oil company use	3,861.9	ND	ND	ND	3,861.9	2.0
Construction	2,592.2	ND	1,194.0	ND	3,786.2	2.0
Institutions	ND	3,101.9	401.0	ND	3,502.9	1.8
Other (uses identified)	6,259.2	15,778.4	3,639.0	78.0	25,754.6	13.5
Unidentified uses of gasoline 2/	0.0	0.0	6,359.0 2/	0.0	6,359.0	3.3
Total	92,557.2	61,667.0	31,669.0	4,707.0	190,600.2	100.0

Source: "Energy Use in Hawaii", Department of Planning and Economic Development, State of Hawaii, Nov. 1977.

Notes: ND - Not defined as an end user by fuel or energy distributors.

1/ - Airlines allocated between domestic and foreign and local airlines on same proportion as direct deliveries.

2/ - Unidentified uses of service station deliveries amount to 20.0 percent of the total motor gasoline and include usage by non-taxed federal, state, and county vehicles, ambulances, and motorcycles.

Table 2-3
ELECTRICAL CONSUMPTION FOR FOUR MAJOR ISLANDS SUMMARIZED ON THE BASIS OF KWH USED,1976 1/

(Thousands of kWH)

User Category	Total Amount	Total Percent	Oahu	Hawaii	Maui	Kauai
Residential	2,726,795	48.7	2,368,525 5/	158,403	143,145	56,722
Retail	406,338	7.3	346,153	32,695	22,681	4,809
Hotel	374,141	6.7	261,933	49,506	39,129	23,573
Manufacturing	268,623	4.8	259,955	3,940	3,458	1,270
Institutions	277,728	5.0	246,471	15,788	8,455	7,014
Communications	153,240	2.7	133,845 6/	6,457	6,304	6,634
Food processors	99,399	1.8	76,225	6,161	16,413	600
Street lighting	98,619	1.7	74,457	16,088	5,804	2,270
Agriculture	30,288	0.5	10,019	11,714	3,990	4,565
Military	8,917	0.2 2/	(730,000)2/	- 3/	- 3/	8,917 4/
Other	1 152,561	20.6	992,891	60,737	59,472	39,461
Total	5,596,649	100.0	4,770,474	361,489	308,851	155,835
Percent	100.0		85.2	6.6	5.5	2.7

Source: State Energy Office consultant's unpublished report.

Notes:

1/ Molokai not included above amounted to 17,769 kWh in 1975, which would add 0.3 percent to total of all islands.

2/ For Oahu, military accounts are included in above breakdown.

3/ Military on Hawaii and Maui relatively insignificant.

4/ Kauai military separately reported; not distributed by user category as done for Oahu.

5/ Includes military housing and base operations. On Maui and Hawaii military use is not a significant factor.

6/ On Oahu includes military bases devoted to communications.

2.5 FUTURE DEVELOPMENT

Forecasts of regional demographic and economic growth are taken from the OBERS Series E projection [3]. Series E refers to the latest detailed regional and national projection of population, employment, and earnings up to the year 2000. Projections are for the Bureau of Economic Analysis (BEA) economic area 173, encompassing all of the islands in the State of Hawaii, and are summarized in Table 2-4.

Although the OBERS population projections are somewhat low, projections of earning and income are useful to show the relative magnitude of earnings in various industrial sectors. OBERS forecasts average annual growth in earnings and total personal income at 3.5 and 3.6 percent, respectively, between 1970 and 2000. Trade, services, and government sectors are expected to have the highest industrial sector earnings. Per capita income in Hawaii was higher than the national average in 1970, and is expected to remain so throughout the forecast period. The disparity between the national average and Hawaii per capita incomes is expected to decrease over time. Between 1970 and 2000, per capita income is expected to grow at 2.5 percent annually.

Table 2-4

PROJECTED POPULATION, INCOME AND MAJOR SECTOR EARNINGS(OBERS)

HAWAII (BEA AREA 173)
(Constant 1976 Dollars)

	YEAR			
	1980	1985	1990	2000
	(Earnings in million $)			
Agriculture	107	110	114	128
Mining	0	0	0	0
Construction	317	370	432	580
Manufacturing	255	295	342	455
Transportation utilities	329	399	483	697
Trade	549	643	752	1,035
Finance	262	324	400	598
Services	712	896	1,127	1,721
Government	1,211	1,443	1,721	2,431
Total Earnings	3,741	4,483	5,372	7,646
Total Personal Income	4,555	5,502	6,645	9,575
Total Population (thousands)	847	911	979	1,085
Per Capita Income ($)	5,375	6,042	6,791	8,823
Per Capita Income Relative To U.S.	1.12	1.11	1.10	1.08

Source: 1972 OBERS Projections, Regional Economic Activity on the U.S., Series E Population, U.S. Department of Commerce, Bureau of Economic Analysis, 1974.

Note: Sum of sector earnings may not equal the total because of discrepancies in OBERS data.

References

1. Department of Planning and Economic Development, State of Hawaii, 1977, Energy Use in Hawaii.

2. U.S. Army Engineer District - Honolulu, 1977, Hydroelectric Power, Plan of Study, Harbors and Rivers in Hawaii.

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Chapter 3
EXISTING ENERGY SYSTEMS

3.1 EXISTING ENERGY SYSTEMS EXCLUDING HYDROPOWER

Nuclear

There are no nuclear power plants in the State of Hawaii. The technology for producing power on a commercial basis from the fission process is well developed but is economical only in large-scale units. Even the smallest commercial reactors are too large for integration into the region's electrical systems before the turn of the century.

Oil

Hawaii derives 92 percent of all energy from petroleum. More than half of it is used for transportation in the form of jet fuel and gasoline. About 25 percent of it is used for the generation of electricity.

There are a total of five utility companies servicing the main populated islands. All of the companies are investor-owned but are regulated by the State Public Utility Commission. Each of the islands is served by independent power systems. There is no interconnection of power between the islands. The utility companies are:

Island	Company
Oahu	Hawaiian Electric Company (HECO)
Hawaii	Hawaii Electric Light Company (HELCO)
Kauai	Kauai Electric Division of Citizens Utility Company (KED)
Maui-Lanai	Maui Electric Company (MECO)
Molokai	Molokai Electric Company (MOECO)

The largest company in the State is Hawaiian Electric Company (HECO). Two companies on neighbor islands, Maui Electric and Hawaii Electric Light, are wholly owned subsidiaries of HECO. The island of Lanai is serviced by Maui Electric but the generating plant and most of the distribution lines are owned by the privately-owned Dole Company.

These five oil-burning utilities generated 6,541 GWh of electricity in 1978, 90.5 percent of the State's total electric power. The major generating equipment in Hawaiian Electric Company's system is designed to burn residual fuel oil. Even with today's critical oil situation, oil remains Hawaii's most economical source of energy. Alternative energy sources including biomass (chiefly the sugarcane waste, bagasse), wind, geothermal energy, refuse, and ocean thermal energy conversion (OTEC) will be developed to reduce dependence on oil. However, in the foreseeable future, oil is expected to be the main source of electrical energy.

Coal

Major economic and environmental problems will be encountered if petroleum fuels are to be replaced by coal. Coal is expensive in Hawaii because it must be imported from overseas. In addition, for large-scale seaborne transport of coal to power plants in Hawaii, a new ocean bulk handling system, port facilities, unloading and storage areas, and a surface transportation system from dockside to generation plant would have to be built at a large investment cost. The environmental problems would arise from the fact that, because of the higher impurities content, control of environmentally unacceptable pollutants such as sulfur dioxide and particulates is more difficult, and large quantities of ash require disposal.

Waste Material

Hawaii obtains about 7 percent of its energy by burning waste material. Electrical generation in the State of Hawaii was first begun in the sugar mills to power the processing of sugar and has evolved along with these agriculture-based origins. Power is produced by the agricultural processing power plants by burning a residual product of sugarcane, bagasse. In 1978, private companies generated 687 GWh of electrical energy, mainly from bagasse, or 9.5 percent of the total electric energy generated in the State, which was 7,228 GWh in that year. In 1978, bagasse supplied 38 percent of the electrical energy of the island of Hawaii and 23 percent of the island of Kauai. A 12 MW bagasse power plant was completed in 1980, forming an integral part of the Lihue Sugar Plantation facilities in Kauai. The power plant, built under a cooperative agreement among Foster-Wheeler Corporation, AMFAC and Kauai Electric, will annually produce 55.6 GWh of electrical energy. Refuse is another potential source of energy. The City and County of Honolulu is considering implementation of a solid refuse treatment plant. If constructed, the power plant is expected to produce 48 MW of power, totalling 4 percent of Hawaiian Electric's installed capacity.

Geothermal Energy

Natural heat from the earth shows great long-range potential for Hawaii's energy future. Economic comparisons generally show that geothermal energy is competitive with conventional energy sources. High-temperature water can be used for power generation, while water in the intermediate temperature range may find application in manufacturing processing, desalting of sea water, and agriculture. Geothermal environmental problems are relatively minor; potentially, there could be some impact in the form of noxious gases, noise from exhaust steam, ground subsidence, and water contamination.

Practically all potential developable geothermal energy is located in the Island of Hawaii. Although the amount of recoverable geothermal energy is still unknown, a test well (HGP-A) was drilled 6,450 feet into the eastern rift of Kilauea volcano on Hawaii Island in 1976 to explore geothermal potential. Construction of a 3 MW geothermal power plant to utilize the steam from HGP-A, which is funded by the Department of Energy, began in January of 1980. The Hawaii Electric Light Company has agreed to purchase at least 2

MW of energy for the first two years the generator operates. The first production of electricity from geothermal energy is scheduled for mid-1981. If huge reservoirs are found yielding greater energy than is needed on the Island, breakthroughs in undersea transport of energy will be necessary before power can be transmitted to the other islands. Hawaiian Electric Company is currently investigating the feasibility of placing undersea power transmission cables between the islands.

Wind

Enormous amounts of energy are contained in the persistent trade winds that sweep the Hawaiian Islands. Wind power is a renewable natural energy resource and has the advantage of generating no noxious substances. It shows excellent potential for providing a significant percentage of the future energy requirements of Hawaii. The best wind locations in the Hawaiian Islands include Kahuku on Oahu, Kahua Ranch on Hawaii Island, West Molokai, and McGregor Point on Maui. A 200-kW wind machine has been built at Kahuku, partially funded by the U.S. Department of Energy. The model MOD-0A machine used here was built and erected by Westinghouse Electric Corporation. Hawaiian Electric has an agreement with Windfarms Ltd. to purchase 80 MW of wind generated electricity which is expected to be on line in three to four years.

Ocean Thermal Energy Conversion (OTEC)

Hawaii has warm surface water and deep cold water near shore the year round. The technology of OTEC would use this thermal energy differential to produce electricity. Should OTEC systems become a practical reality, Hawaii could become energy selfsufficient. A small demonstration plant, Mini-OTEC, has proved successful and produced 50 kW of electricity. Commercial OTEC's would range in capacity from 200 MW to 400 MW at an estimated power generation cost of as low as 4 cents per kWh. However, problems of marine fouling of equipment and transmission of the electric energy remain to be overcome. In addition, recent funding limitations of the Federal government will severely constrain future applied research and development of OTEC.

Summary

In the State of Hawaii electric power is generated on the six developed islands of Oahu, Hawaii, Kauai, Maui, Lanai and Molokai. Each of the islands has its own electrical system, and there is no interconnection of power transmission lines between the islands. Most of the State's power is generated by the oil-burning utility companies. In 1978, these companies generated 92.4 percent of the electric power (excludes hydropower). The remaining 7.6 percent was generated mainly by the sugar companies for their own consumption.

All electric power on the island of Molokai is generated by the Molokai Electric Company. On the island of Oahu, Hawaiian Electric Company generated 98 percent of electric power in 1978. The remaining 2 percent of the island's total electricity was produced by three sugar companies; Oahu, Waialua, and California and Hawaii. On the other major islands private companies generate a much more significant portion of the electric power; in 1978, private companies produced 47.2 percent of the total nonhydropower on the island of Hawaii, 27.4 percent on the island of Kauai, and 18.4 percent on the islands of Maui and Lanai. Table 3-1 displays the capacity and energy generation of the existing electric system.

Table 3-1

ELECTRICAL POWER CAPACITY AND ENERGY GENERATED HAWAII, 1978

	Entire System 1/			NonHydroelectric 2/		
		Percent of Total			Percent of Total	
	Total	Utility	Private	Total	Utility	Private
Oahu Island						
Installed capacity, MW	1,236	98.0	2.0	1,236	98.0	2.0
Energy generated, GWh	5,723	98.0	2.0	5,723	98.0	2.0
Hawaii Island						
Installed capacity MW	163	65.0	35.0	159	64.5	35.5
Energy generated, GWh	558	54.9	45.1	527	52.8	47.2
Kauai Island						
Installed capacity MW	106	59.0	41.0	98	63.4	36.6
Energy generated, GWh	299	61.4	38.6	253	72.6	27.4
Maui and Lanai Islands						
Installed capacity MW	142	59.3	40.7	137	61.5	38.5
Energy generated, GWh	619	67.4	22.6	589	81.6	18.4
Molokai Island						
Installed capacity MW	7	100.0	-	7	100.0	-
Energy generated, GWh	29	100.0	-	29	100.0	-
State of Hawaii						
Installed capacity MW	1,654	88.9	11.1	1,637	89.6	10.4
Energy generated, GWh	7,228	90.5	9.5	7,121	92.4	7.6

Notes:

1/ "State Energy Plan", Department of Planning and Economic Development, State of Hawaii, September 1980.

2/ Derived from Table 3-2

3.2 ROLE OF EXISTING HYDROPOWER WITHIN EXISTING ENERGY SYSTEM

Relationship of Hydropower Within Existing System

Hydropower facilities were originally installed to supplement the needs of the plantation industry. Only three islands now have developed and operating hydropower plants. These are Maui, with 7.1 MW installed capacity; Kauai, with a 7.9 MW capacity; and the island of Hawaii, with 4.2 MW capacity. Of the 20 operating and retired hydropower plants on the islands, 18 are owned by sugar plantations for their own industrial use, and two are owned by a utility company. Only 13 hydropower plants are operating in the State. Their total installed capacity is 19.2 MW, producing an average energy of 107.1 GWh per year. Hydropower accounted for 1 percent of the State's total electric power in 1978. An inventory of hydropower plants in the islands is shown in Table 3-2.

Hawaii Electric Light Company, Inc. (HELCO), the utility which serves the island of Hawaii, is a subsidiary of HECO. HELCO is also the only utility company that operates hydropower plants. The plants are located near Hilo, the largest area of consumption. The hydropower plants operated by the sugar plantations are largely part of irrigation systems, and power generation is dependent to some extent on seasonal rainfall and crop irrigation priorities.

Marketing and Regulations

There is no electric reliability council in the State of Hawaii. The State is not serviced by a Federal power marketing agency since there is no Federal power marketed in Hawaii. However, any potential Federal power marketing activities will be performed by the U.S. Department of Energy. Currently there are no hydropower plants in the State licensed by the Federal Energy Regulatory Commission (FERC). Licensing is required for nonfederal development in the following cases: (1) development is on an historically navigable stream or a stream which could reasonably be improved for navigation; (2) development is on Federal land; or (3) energy is transmitted interstate. FERC has enacted a new rule to permit owners of small hydropower projects (5 MW or less) to apply for exemption of licensing requirements provided the site is not on Federal land and does not require construction of a new dam.

Hydropower facilities operated by utility companies are regulated by the Public Utilities Commission (PUC) of the State of Hawaii under the Department of Budget and Finance. The PUC does not regulate the hydropower plants owned by sugar companies if the sole use is industrial. However, when sugar companies sell excess power to utilities for public consumption, the rates must be approved by the PUC.

Parameters Governing Use of Existing Hydropower

Hydraulic turbines do not perform well when actual flow is substantially different from the design flow. In Hawaii, since most of the runoff comes during the winter months (November through March) existing turbines are not

Table 3-2
EXISTING HYDROELECTRIC PLANTS

Island and location	Stream	Owner	Owner class	Static head (feet)	Installed capacity (kW)	Average Annual Energy (GWh)	First year operated
Hawaii							
Wainaku Mill	Maili	HCPC	P	200	60*	----	Pre-WW II
Puueo	Wailuku	HELCO	I	400	2,250	19.0	1918
Waiau	Wailuku	HELCO	I	322	1,100	9.2	1921
Papaikou Mill	Honolii	HCPC	P	207	150*	----	Pre-WW II
Hakalau Mill	Hakalau/Kolekole	HCPC	P	265	75*	----	Pre-WW II
Paauhau	Lo. Hamakua Ditch	PASC	P	473	150*	----	N.A.
Honokaa	Lo. Hamakua Ditch	HOSU	P	415	800	3.0	N.A.
Union	Kohala Ditch	KOSC	P	565	500*	----	1940
Hawi	Kohala Ditch	KOSC	P	371	350*	----	1923
Maui							
Kauaula	Kauaula	PIMC	P	535	500	2.0	1918
Paia	Wailoa Ditch	HACS	P	260	800	2.8	1912
Kaheka	Wailoa Ditch	HACS	P	660	5,800	25.0	1924
Kauai							
Wainiha	Wainiha	MBSC	P	565	3,600	24.0	1906
Waimea	Waimea	KESC	P	265	1,000	5.0	1954
Waiawa	Kahoana	KESC	P	275	500	1.9	1907
Hydro Kaumakani	Makaweli	OLSC	P	211	500	3.1	1920
Alexander Res	Wahiawa	MBSC	P	700	1,000	2.1	1928
Malumalu	Waihohonu	MBSC	P	150	128*	----	1919
Lower Lihue	North Wailua & Iliiliula Ditches	LIPC	P	206	800	5.0	1941
Upper Lihue	North Wailua & Iliiliula Ditches	LIPC	P	247	500	3.1	1930

Source:
1. "Alternate Energy Sources for Hawaii", Hawaii Natural Energy Institute, University of Hawaii, and Department of Planning and Economic Development, State of Hawaii, February 1975.
2. Input from owners, 1979-1980.
3. Energy generation estimated by the Pacific Ocean Division, U.S. Army Corps of Engineers.

Abbreviations:

HELCO - Hawaii Electric Light Co., Ltd
PASC - Paauhau Sugar Co.
HOSU - Honakaa Sugar Co.
KOSC - Kohala Sugar Co.
PIMC - Pioneer Mill Co., Ltd.
HCPC - Hilo Coast Processing Co.
HACS - Hawaiian Commercial & Sugar Co.
MBSC - McBryde Sugar Co., Ltd.
KESC - Kekaha Sugar Co., Ltd.
OLSC - Olokele Sugar Co., Ltd.
GRFC - Grove Farm Co., Ltd.
LIPC - Lihue Plantation Co.
N.A. - Not Available
I - Investor-owned utility
P - Commercial or Industrial Firm
* Denotes inactive sites

being fully used. Because of relatively small drainage basins having only one principal stream with minor tributaries, streamflows are low, highly variable, and largely unregulated. Hydropower plant capacities are small, usually operated on run-of-river streamflows. Most hydropower plants were installed by the plantations in their irrigation ditches. In addition, in contrast to most mainland installations, practically all of the existing projects are characterized as high head, low discharge facilities and utilize impulse-type (Pelton) turbines.

During the past decade many hydropower plants were deactivated or abandoned. In certain instances, sugar plantations owning plants went out of business; in other cases, turbine/generator equipment no longer performed effectively. However, some plants could be reactivated and there is potential for increasing the capacity of currently active plants. The prospect for reactivation is enchanced by certain recent developments:

a. Sharply rising petroleum prices make hydropower economically attractive.

b. There is an increasing interest among the plantations to sell energy as a prime source of revenue.

c. The implementation of the Public Utility Regulatory Policies Act (PURPA) of 1978 mandating regulatory agencies to establish energy rates based on avoided petroleum costs assures hydropower producers of receiving a fair market price. This has spurred plantations to take a second look at their existing and new alternative energy systems.

d. There is a growing recognition that the combination of wet-season hydropower and dry-season bagasse could produce year round firm power for possible sale to a utility.

References

1. Department of Planning and Economic Development, State of Hawaii, 1977, Energy Use in Hawaii.

2. Department of Planning and Economic Development, State of Hawaii, 1980, State Energy Plan.

3. Federal Power Commission, Bureau of Power, 1966, Planning Status Report; Hawaii River Basins.

4. Hawaii Natural Energy Institute, University of Hawaii, and Department of Planning and Economic Development, State of Hawaii, 1975, Alternate Energy Sources for Hawaii.

5. Pacific Analysis Corporation, 1977, An Inventory and Analysis of the Electrical Energy Industry in the State of Hawaii (prepared for the U.S. Army Corps of Engineers).

Chapter 4
DEMAND SUMMARY

Forecasts of electricity demand have been made by the State of Hawaii (Table 4-1) and Hawaiian Electric Company and Kauai Electric Division (Table 4-2). Another forecast was made in a study by Harza Engineering Company for the Institute for Water Resources, U.S. Army Corps of Engineers (Table 4-3 [1, 2]. In that study, three projections of electricity demand were developed for use in assessing the regional market for hydropower. Projection I was derived from forecasts made by the utilities [5]. Projection II was derived from the forecast made by the Institute for Energy Analysis (IEA) at the Oak Ridge National Laboratory in May 1977 [3]. Projection III was based on the "Consensus Forecast of U.S. Electricity Demand" [4]. From these three projections, a "median" forecast was selected and is considered to be representative of future power and energy demand of the State. The OBERS population forecasts are adjusted to reflect the latest census [4].

4.1 Capacity

The peak demand for all the utility companies in the State of Hawaii was 1,120 MW in 1978, up from 726.6 MW in 1969. The total utility-installed capacity increased from 862 MW in 1968 to 1,470 MW in 1978 which was 88.9 percent of the total installed capacity in the State. Table 4-4 shows the peak load and installed capacity from 1968 to 1978. The majority of the peak load occurs on Oahu. However, Oahu's share of the total peak load in the State decreased from 86.4 percent in 1969 to 81.9 percent in 1978. This is attributable to the faster growth of the Neighbor Islands during the past decade. Installed capacity on Oahu constituted 84.2 percent of the State's total capacity in 1968. This percentage has reduced to 81.3 in 1978.

Hawaii's peak demand now occurs in winter and it is expected to continue doing so in the future. According to Harza's projection, the peak demand between 1978 and 1985 is likely to grow at an average annual rate of 4.5 percent from 1,100 MW to 1,500 MW. After 1985, annual growth in peak demand is likely to be about 4.0 percent until 1990, then 3.6 percent through the end of the century. The peak demand is expected to be 2,600 MW in 2000.

Utilities projected peak load is somewhat lower. As shown in Table 4-2, it will only be 2,127 MW in 1998. This projection does not cover Molokai Electric Company which constituted less than 0.5 percent of the total peak load for the utility companies in 1978. Also shown in Table 4-2 are the utilities projected generating capacities. The planned additions are presented in Table 4-5. The Neighbor Islands are expected to exceed Oahu's rate of growth in the next two decades. Projected peak load and installed capacity for Oahu in 1998 are 70.9 and 71.0 percent of the State's total, respectively. These percentages are considerably lower than 1978. Maui is projected to have the most significant gain in peak load; from 7.0 percent in 1978, to 18.1 percent in 1998, and in generating capacity from 5.7 percent in 1978 to 16.8 percent in 1998. Kauai, the island with the most

Table 4-1
STATE PROJECTED ELECTRICAL ENERGY DEMAND FORECAST, HAWAII, 1980-2005

Year	Oahu		Hawaii		Maui Lanai, Molokai		Kauai		State	
	Energy (GWh)	Avg. Ann. Growth Rate (%)	Energy (GWh)	Avg. Ann. Growth Rate (%)	Energy (GWh)	Avg. Ann. Growth Rate (%)	Energy (GWh)	Avg. Ann. Growth Rate (%)	Energy (GWh)	Avg. Ann. Growth Rate (%)
1980	5,057	-	435	-	509	-	187	-	6,187	-
1985	5,350	1.13	522	3.71	799	9.45	230	4.26	6,900	2.21
1990	6,213	3.04	604	2.98	1,071	6.04	272	3.38	8,159	3.41
1995	6,767	1.72	677	2.31	1,285	3.72	297	1.81	9,027	2.04
2000	7,466	1.99	720	1.23	1,395	1.65	306	0.58	9,887	1.84
2005	8,345	2.25	771	1.39	1,497	1.42	314	0.54	10,926	2.02

Source: "State Energy Plan," Department of Planning and Economic Development, State of Hawaii, September 1980.

Table 4-2
PUBLIC UTILITIES PROJECTED PEAK LOAD AND GENERATING CAPACITIES, HAWAII 1979-98

YEAR	HECO		HELCO		MECO		KED	
	Peak Load(mw)	Capacity (mw)	Peak Load(mw)	Capacity (mw)	Peak Load(mw)	Capacity (mw)	Peak load(mw)	Capacity (mw)
1979	906	1209	87	124	87	99	36.5	62.1
1980	994	1350	90	124	95	112	38	62.1
1981	1022	1350	93	124	103	112	39.6	74.1*
1982	1049	1350	97	124	112	125	41.2	74.1
1983	1077	1350	100	124	121	138	42.8	74.1
1984	1106	1350	103	127	131	151	44.4	74.1
1985	1136	1350	107	141	141	164	46.1	74.1
1986	1163	1420	110	141	152	164	47.7	74.1
1987	1191	1420	114	141	165	190	49.3	74.1
1988	1220	1420	118	141	178	203	50.9	74.1
1989	1249	1489	122	155	192	216	52.6	82.1
1990	1278	1489	127	155	207	229	54.2	82.1
1991	1307	1559	131	155	224	255	55.8	82.1
1992	1336	1559	136	168	242	268	57.4	82.1
1993	1365	1729	140	168	261	294	59.1	92.1
1994	1395	1729	145	168	282	307	60.7	92.1
1995	1426	1729	150	182	305	333	62.3	92.1
1996	1453	1729	156	182	329	359	63.9	114.3
1997	1481	1729	161	196	355	398	65.6	114.3
1998	1509	1799	167	196	384	424	67.2	114.3

* Kauai Electric Division will have contract purchase power from Lihue Plantation amounting to 12 MW in 1981; thus, planned additions by the public utility itself are not projected to occur until 1989.

SOURCE: Official HECO and KED projections, 1979.

Abbreviations:

HECO - Hawaiian Electric Company
HELCO - Hawaii Electric Light Company
MECO - Maui Electric Company
KED - Kauai Electric Division of Citizens Utility Company

Table 4-3
HARZA PROJECTED POWER DEMAND FORECAST, HAWAII 1978-2000

	1978	7-year Growth Rate 1/ %	1985	5-year Growth Rate 1/ %	1990	5-year Growth Rate 1/ %	1995	5-year Growth Rate 1/ %	2000	5-year Growth Rate 1/ %
Population (Thousands)	897.	1.7	1007.0	1.4	1080.0	1.0	1135.0	1.0	1193.0	1.3
Projection I										
Per Capita Consumption (MWh)	7.5	1.8	8.6	1.7	9.3	2.1	10.3	2.1	11.5	1.9
Total Demand (Thousand GWh)	6.8	3.5	8.6	3.1	10.0	3.2	11.7	3.1	13.7	3.2
Peak Demand (GW)	1.1	3.7	1.4	3.0	1.7	3.2	1.9	3.1	2.3	3.3
Projection II										
Per Capita Consumption (MWh)	7.5	2.6	9.0	2.6	10.3	2.6	11.7	2.6	13.3	2.6
Total Demand (Thousand GWh)	6.8	4.3	9.1	4.0	11.1	3.6	13.2	3.6	15.8	3.9
Peak Demand (GW)	1.1	4.5	1.5	4.0	1.8	3.6	2.2	3.6	2.6	4.0
Projection III										
Per Capita Consumption (MWh)	7.5	4.3	10.3	4.0	12.5	3.3	14.7	3.2	17.2	3.8
Total Demand (Thousand GWh)	6.8	6.2	10.3	5.5	13.5	4.3	16.7	4.2	20.5	5.2
Peak Demand (GW)	1.1	6.4	1.7	5.4	2.2	4.3	2.8	4.2	3.4	5.2
Median Projection										
Per Capita Consumption (MWh)	7.5	2.6	9.0	2.6	10.3	2.6	11.7	2.6	13.3	2.6
Total Demand (Thousand GWh)	6.8	4.3	9.1	4.0	11.1	3.6	13.2	3.6	15.8	3.9
Peak Demand (GW)	1.1	4.5	1.5	4.0	1.8	3.6	2.2	3.6	2.6	4.0
Margin (Percent)			25.0		25.0		25.0		25.0	
Resources To Serve Demand (GW)			1.9		2.3		2.7		3.3	
Load Factor (Percent)	69.5		68.7		69.0		69.0		69.0	

1/ The Growth Rates Are Average Annual Compounded Rates Over The Period.

Source: "The Magnitude and Regional Distribution of Needs for Hydropower, The National Hydropower Study: Phase II - Future Electric Power Demand and Supply," Harza Engineering Company, Report Prepared for the U.S. Army Corps of Engineers, 1980.

Table 4-4

HISTORICAL INSTALLED CAPACITY AND PEAK LOAD, HAWAII 1968-1978

Year	HECO		HELCO		MECO		KED		MOECO		Total	
	Peak Load(MW)	Capacity (MW)	Peak Load(MW)	Capacity (MW)	Peak Load(MW)	Capacity (MW)	Peak Load(MW).	Capacity (MW)	Peak Load(MW)	Capacity MW)	Peak Load(MW)	Capacity (MW)
1968	567	725.9	40	57.2	28	50	17.8	22.3	-	6.6	-	862
1969	628	725.9	44.8	57.2	31	50	19.6	22.3	3.2	6.6	726.6	862
1970	680	873	51	60.8	34	40	21.9	22.3	3.7	6.6	790.6	1,002.7
1971	726	873	56.8	60.8	39	42.8	24.3	22.3	3.7	6.6	849.8	1,005.5
1972	780	963	61.8	71.8	43	48.3	27	22.3	3.7	7.9	915.5	1,113.3
1973	815	1,068.4	66	73.8	48	60.6	29.4	39.9	4.1	7.9	962.5	1,250.6
1974	838	1,209.4	69	102.3	55	60.6	29.4	39.9	3.9	7.9	995.3	1,420.1
1975	854	1,209.4	71	103.6	60	72.9	31.9	39.9	4.3	7.9	1,021.2	1,433.7
1976	896	1,209.4	78	124.3	67.2	72.9	31.7	39.9	4.5	7.9	1,077.4	1,454.4
1977	911	1,209.4	80.5	124.3	73.1	79.1	33.7	62.1	4.8	6.9	1,103.1	1,481.8
1978	917	1,209.4	83.3	124.3	78.7	85.2	35.9	62.1	5.1	6.5	1,120	1,487.5

Sources:
1. "An Inventory and Analysis of the electric Energy Industry in the State of Hawaii," Pacific Analysis Corporation, Prepared for the U.S. Army Corps of Engineers, Pacific Ocean Division, 29 March 1977.
2. State of Hawaii Data Book 1977-79.
3. State of Hawaii Public Utilities Commission's Record.

Abbreviations:

HECO - Hawaiian Electric Company
HELCO - Hawaii Electric Light Company
KED - Kauai Electric Division of Citizens Utility Company
MECO - Maui Electric Company
MOECO - Molokai Electric Company

Table 4-5

PLANNED ADDITIONS TO ELECTRIC GENERATING CAPACITY, PUBLIC UTILITIES, HAWAII 1979-98

(Megawatts)

	Location of Planned Additions				
	Oahu	Hawaii		Maui	Kauai
	Kahe	Waimea	Ke-ahole	Maalaea	Lihue
1979				14	
1980	141			13	
1981					
1982				13	
1983				13	
1984		3		13	
1985			14	13	
1986	70				
1987				26 (2 units)	
1988				13	
1989	69		14	13	8
1990				13	
1991	70			26 (2 units)	
1992			13	13	
1993	170			26 (2 units)	10
1994				13	
1995			14	26 (2 units)	
1996				26 (2 units)	22.2
1997			14	39 (3 units)	
1998	70			26 (2 units)	

Source: Official HECO and KED projections, 1979.

Note: Kauai Electric Division will have contract purchase power from Lihue Plantation amounting to 12 MW in 1981. Thus, planned additions by the utility are not projected to occur until 1989.

hydropower potential, is expected to remain at 3.2 percent in peak load and grow slightly from 4.2 percent in 1978 to 4.5 percent in 1998 in generating capacity.

4.2 ENERGY

The electric energy sold by the utilities in the State of Hawaii for 1978 was 6,005 GWh, increased from 3,104 GWh in 1968. This corresponds to an average annual growth rate of about 6.8 percent. Electricity data for all utility companies from 1968 to 1978 are presented in Table 4-6.

The "median" electric energy demand in Hawaii as projected by Harza, is expected to grow from a projected 6,800 GWh in 1978 to 9,100 GWh in 1985, an average annual growth rate of 4.3 percent. The electric energy demand is expected to grow to approximately 15,800 GWh by the year 2000, an average annual growth rate of 3.9 percent between 1978 and 2000. The island of Oahu currently consumes the largest portion of electrical energy generated. The island of Maui is expected to have an accelerated growth in demand because of its expanding tourist industry.

Projections by the State are based on the assumption that conservation measures, such as improved efficiency in appliances, will be adopted. As a result, an average annual growth rate of 2.3 percent from 1980 to 2005 is shown. This projection also reflects the anticipated consumption levels for electricity regardless of the primary energy source utilized for electric generation.

In 1978, Hawaii's annual load factor was 69.5 percent. The annual load factors for the Hawaiian Electric Company and its subsidiaries, Hawaii Electric Light Company and Maui Electric Company, increased from 57.7 percent in 1970 to 62.3 percent in 1977. From projected peak and energy demand forecasts by the utilities, future load factors are expected to average 69 percent.

Table 4-6
HISTORICAL ELECTRICITY DEMAND, HAWAII, 1968-78
(GWh)

	Utility					
Year	HECO	HELCO	KED	MECO	MOECO	Total
1968	2,728	166	78	119	13	3,104
1969	3,004	186	90	126	14	3,420
1970	3,276	214	103	146	15	3,754
1971	3,601	247	112	186	16	4,162
1972	3,943	279	121	197	17	4,557
1973	4,189	302	132	221	17	4,861
1974	4,393	320	136	243	17	5,109
1975	4,555	333	149	275	18	5,330
1976	4,762	363	156	316	19	5,616
1977	4,911	377	167	353	23	5,831
1978	5,025	394	179	382	25	6,005

Sources: 1. "An Inventory and Analysis of the Electric Energy Industry in the State of Hawaii," Pacific Analysis Corporation, Prepared for the U.S. Army Corps of Engineers, Pacific Ocean Division, 29 March 1977.
2. State of Hawaii Data Book 1977-79.

Abbreviations:

HECO - Hawaiian Electric Company
HELCO - Hawaii Electric Light Company
KED - Kauai Electric Division of Citizens Utility Company
MECO - Maui Electric Company
MOECO - Molokai Electric Company

References

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Chapter 5
METHODOLOGY

5.1 REGIONAL PROCEDURES AND CRITERIA

Regional Screening Criteria

Potential hydropower projects in the region were screened according to physical, economic, and environmental considerations. Screening was performed in four progressive stages. Only projects that demonstrate an appropriate level of physical potential, marketability, and environmental or social acceptability were considered for future development.

Stage 1

An inventory of the existing dams, existing hydropower facilities, and undeveloped sites having the physical potential to generate hydropower was made to provide the data base for the screening process. Only sites in one of the following categories were retained for evaluation in Stage 2:

1. Existing dams exceeding 40 feet of head and 800 acre-feet of storage.

2. Existing hydropower facilities with any potential incremental capacity.

3. New undeveloped sites with developable capacity exceeding 100 kW.

Stage 2

A second screening of the sites in the inventory identified those sites which show some possibility of being marketable. Site-specific data were coded and analyzed by computer programs which evaluated site hydrology, project costs and benefits, and identified the scope of project by maximizing net benefits. Sites which did not show promising marketability were deleted from further consideration.

Stage 3

In the third stage, sites were screened on the basis of environmental, social and institutional considerations. Sites with overriding adverse environmental, social, or institutional impacts were removed from consideration.

Stage 4

For all sites passing the first three stages, economic evaluations were performed manually using cost curves published in references 7 and 9. Costs obtained from these curves may not entirely agree with manufacturer and contractor bid prices. However, since the intent of this study is to make a comparative analysis of potential projects, absolute accuracy of cost estimates is not critical. The unit energy cost for each project was estimated by comparing the project cost with the amount of energy generated. Projects costs were adjusted to the June 1980 price level based on a construction cost index. Annual costs include interest and amortization of total construction costs, based on a project economic life of 50 years and an interest rate of 7-1/8 percent, and annual maintenance and operation costs.

Data Collection Procedures

All existing dams, existing hydropower facilities, and undeveloped sites with reasonable hydropower development potential were considered to be possible sites for new or incremental hydropower development. Data on the location, ownership, available power head, and potential flow were collected for each site.

Stage 1

The data base for potential hydropower sites was established principally from two sources; the National Program of Inspection of Dams [10] and hydroelectric power resources data published by Federal Power Commission [5]. Other references [1, 2, 3, 4, 6, 8, 11, 12] were also utilized and pertinent data were adopted to complement the inventory.

Stage 2

Additional site specific data from published and unpublished reports and topographical maps as required for computer analysis, were collected during this stage. However, no site visits or field surveys were made. These data include location and identification, physical and hydrologic characteristics, and power features that were not in the Stage 1 data base.

Stage 3

Estimates of the capacity and energy generation of potential projects were determined by computer. Copies of these estimates were distributed to the concerned public for their information and comments. As a result of this public-involvement process, more data and information were obtained to modify the data base.

Stage 4

There were no data collection activities during Stage 4.

Screening Procedures and Evaluation

Stage 1

Data collected from various sources were evaluated and compared with the Stage 1 criteria. Data for sites exceeding minimum head/storage or minimum capacity were included in the preliminary inventory data base.

Stage 2

Data for sites identified during Stage 1 were added to the computerized data base for site specific evaluation. The computer performed (1) analysis of streamflow data using flow-duration techniques to develop a range of capcity and energy potentials; (2) computation of project benefits using FERC power values; (3) computation of powerhouse and switchyard costs from generalized cost curves; and (4) identification of the scope of project which would maximize net benefits. Results of the computer analysis indicated that all potential projects had a reasonable likelihood of marketability and, therefore, no sites were dropped during this stage.

Stage 3

A few sites were screened out because of environmental, social or institutional problems because (1) sites were in significant environmental pristine areas (2) sites were of questionable safety; (3) sites had incremental capacity potential of 100 kW or less; or (4) for existing hydropower plants there was no expansion potential.

Stage 4

Marketability of power that would be generated at each site was evaluated manually (the results of the computer analysis were not used), and a ranking of the projects was made according to unit energy costs. Potential energy generation from these sites falls short of meeting the projected future demand for the State and for each of the islands. To meet the regional objective of increasing Hawaii's energy self-sufficiency, all potentially feasible sites were identified as suitable for further study and no further screening was performed at this stage.

References

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Chapter 6
PUBLIC INVOLVEMENT

6.1 ROLE OF PUBLIC INVOLVEMENT

In this study, the purposes of public involvement were to keep the public informed about the status and findings of the National Hydroelectric Power Study (NHS); to obtain needed information on existing and potential hydropower facilities; and, to obtain public comment on potential problems.

6.2 PUBLIC CONTACTS

As mentioned in Chapter 5, information and data collected in the 1977-78 hydropower study conducted by the Corps of Engineers were used as part of the data base for this report. In that study, workshops were held at each of the four major islands in the State, namely, Oahu, Hawaii, Maui and Kauai. A public meeting was also held at Kauai. Major input and basic concerns resulting from these public contacts were:

a. Location of hydropower facilities.
b. Effect on water rights.
c. Effect on local electrical rates.
d. Environmental changes.
e. Alternative energy sources.
f. Past and current State studies.

Public information fact sheets on the National Hydroelectric Power Study were distributed to selected government agencies, industries and citizens who have an interest in hydropower development. Attached to the fact sheet were the National Hydroelectric Power Study brochure published by the Institute for Water Resources and data sheets on the preliminary inventory of existing and potential hydropower facilities in Hawaii. Many valuable comments and information were received from the public regarding additional potential sites not included in the inventory and the accuracy of some data in the inventory. The public input was incorporated in the final inventory.

U.S. Army Corps of Engineers staff members also are active participants of the Committee on Small Hydroelectric Power Systems, sponsored by the State of Hawaii, Department of Planning and Economic Development. Representatives from Waialua Sugar Company, Department of Land and Natural Resources of the State of Hawaii, Kauai Electric Division of the Citizens Utilities Company, C. Brewer & Company, AmFac Corp., U.S. Army Corps of Engineers, U.S. Department of Energy, Water Resources Research Center of the University of Hawaii, Alexander & Baldwin, Theo H. Davies & Company, Hawaiian Electric Company & Molokai Electric Company serve on the committee.

The several committee meetings held during March to August 1980 served as forums for discussing the current and future impact of hydropower in the State. A copy of the draft of this report was distributed to each of the committee members for review and comment. The draft report was discussed during the August 1980 committee meeting and additional information and input were obtained and used to revise the report.

Chapter 7
INVENTORY

7.1 STAGE 1, 2 AND 3 RESULTS

Size of Inventory

A total of 14 undeveloped sites and existing projects passed the three-stage screening process. Among these projects, seven are new sites, four are on existing reservoirs, two are active hydropower plants for which additional capacity is possible, and one is a deactivated plant which could be rehabilitated. Collection and analysis of site data were based on available and readily developed information. Detailed engineering and other technical studies were not performed specifically for this study. The results of the study, therefore, are preliminary estimates of developable hydropower within the foreseeable future.

Capacity and Energy

These 14 identified projects have a total capacity potential of 39.39 MW and could generate 119.9 GWh of energy. These estimates include the capacity of 1.5 MW and energy of 8.1 GWh for two currently active hydropower plants. The incremental capacity potential for the State is 37.89 MW and the incrmental energy generation is 111.8 GWh (excluding what is currently available at the two active hydropower plants).

Plant Factors

Plant factors for the identified projects in the inventory vary from 0.17 to 0.94. However, majority of the sites have plant factors between 0.2 and 0.3. This is attributable to the highly variable runoff in most Hawaiian streams in relation to the installed capacity.

Primary Locations

Among the 14 projects in the inventory, more than half are located on Kauai, mainly on the eastern and southwestern parts of the island the remaining projects are located on the islands of Hawaii (2), Maui (3), Oahu (1) and Molokai (1).

Potential Development

All potential projects identified in this study are small-scale in capacity (less than 25 MW). Only one project has a potential capacity of 10 MW, and capacity of all others is less than 5 MW.

Existing Projects

Development of the seven existing projects would be through expansion of existing hydropower plants, rehabilitation of abandoned hydropower sites, or construction of hydropower facilities on existing reservoirs. Total potential capacity created by this type of development is estimated to be 8.86 MW. The amount of energy which could be generated is estimated to be 27.6 GWh.

New Projects

There are seven undeveloped projects in the inventory. These sites have a total capacity of 29.03 MW and energy potential of 84.2 GWh.

7.2 STAGE 4 INVENTORY

Projects Retained During Stage 4

All 14 projects remaining in the inventory after the Stage 3 screening were retained in Stage 4 as suitable for further study. Table 7-1 tabulates some general information and estimated capacity and energy for these projects. Their locations are shown on Figure 7-1.

Physical Characteristics

Selected projects are classified into five groups:

a. Expansion of active hydropower plants.

b. Rehabilitation of abandoned hydropower sites.

c. Construction of hydropower facilities on existing reservoirs.

d. Construction of new run-of-river hydropower facilities.

e. Construction of new storage reservoir hydropower facilities.

Projects in the first two groups are privately owned existing or abandoned hydropower plants. The capacities are small, 1 MW or less. Major work for these projects would be limited to the installation or rehabilitation of turbines and generators.

Civil engineering features, in addition to electromechanical components, will be needed for the group "c" projects. The basic features include site preparation, intake, penstock, powerhouse and switchyard. Existing reservoirs included in this group are relatively small, with the largest having only a maximum storage of 9,000 acre feet. The highest dam is 105 feet high.

Construction works required for group "d" projects are essentially the same as those required for group "c" projects with the exception that diversion systems with limited pondage are included in the plans. Although built on undeveloped sites, carefully designed and constructed run-of-river projects included in group "d" may result in relatively minor changes to the natural environment.

Table 7-1

PRELIMINARY ESTIMATES OF POTENTIAL HYDROPOWER PROJECTS, HAWAII

I.D. No. 1/	Name of Project	Island	Owner	Incremental Capacity MW	Incremental Energy GWh	Type of Project
1	Wailoa	Hawaii	---	2.9	12.3	New site (run-of-river)
6	Union Mill	Hawaii	Kohala Corp	0.5	4.1	Rehabilitation
9	Wahiawa Res	Oahu	Waialua Sugar Co.	2.8	7.5	Existing reservoir
11	Hanalei	Kauai	---	4.5	16.5	New site (run-of-river)
12	Kokee	Kauai	---	10.0	29.2	New site (storage)
14	Waialeale 2/	Kauai	---	7.8	42.7	New site (storage)
15	Puu Lua Res.	Kauai	Kekaha Sugar Co., Ltd.	1.7	3.0	Existing reservoir
16	Kapaia Res.	Kauai	Lihue Plantation Co., Ltd.	0.12	0.2	Existing reservoir
22	Hydro Kaumakani	Kauai	Olokele Sugar Co.	0.75 4/	8.3	Existing plant
23	Waimea	Kauai	Kekaha Sugar Co.	2.9	3.9	Existing plant
31	Wailua 2/	Kauai	---	8.4	18.7	New site (run-of-river)
25	Waihee	Maui	---	0.73	2.0	New site (run-of-river)
30	Hamakua Ditch	Maui	Hawaiian Commercial & Sugar Co.	0.5	2.5	New site (run-of-river)
32	Hoopoi Chute	Maui	Hawaiian Commercial & Sugar Co.	2.0	3.0	New site (run-of-river)
26	Kualapuu Res.	Molokai	State of Hawaii	0.09 3/	0.55	Existing reservoir
	Total			37.89	111.80	

Notes:

1/ Identification numbers are referenced to locations shown on Figure 7-1.

2/ Waialeale and Wailua are alternative development schemes for the same site. Wailua is the preferred development and is the one included in summaries of potential.

3/ This site did not meet the minimum capacity criteria. It was included in the potential project list based on publication of a favorable feasibility study, Feb 1980, State of Hawaii.

4/ New 1.25 MW power plant to be installed. Existing 0.5 MW unit will be used as stand-by.

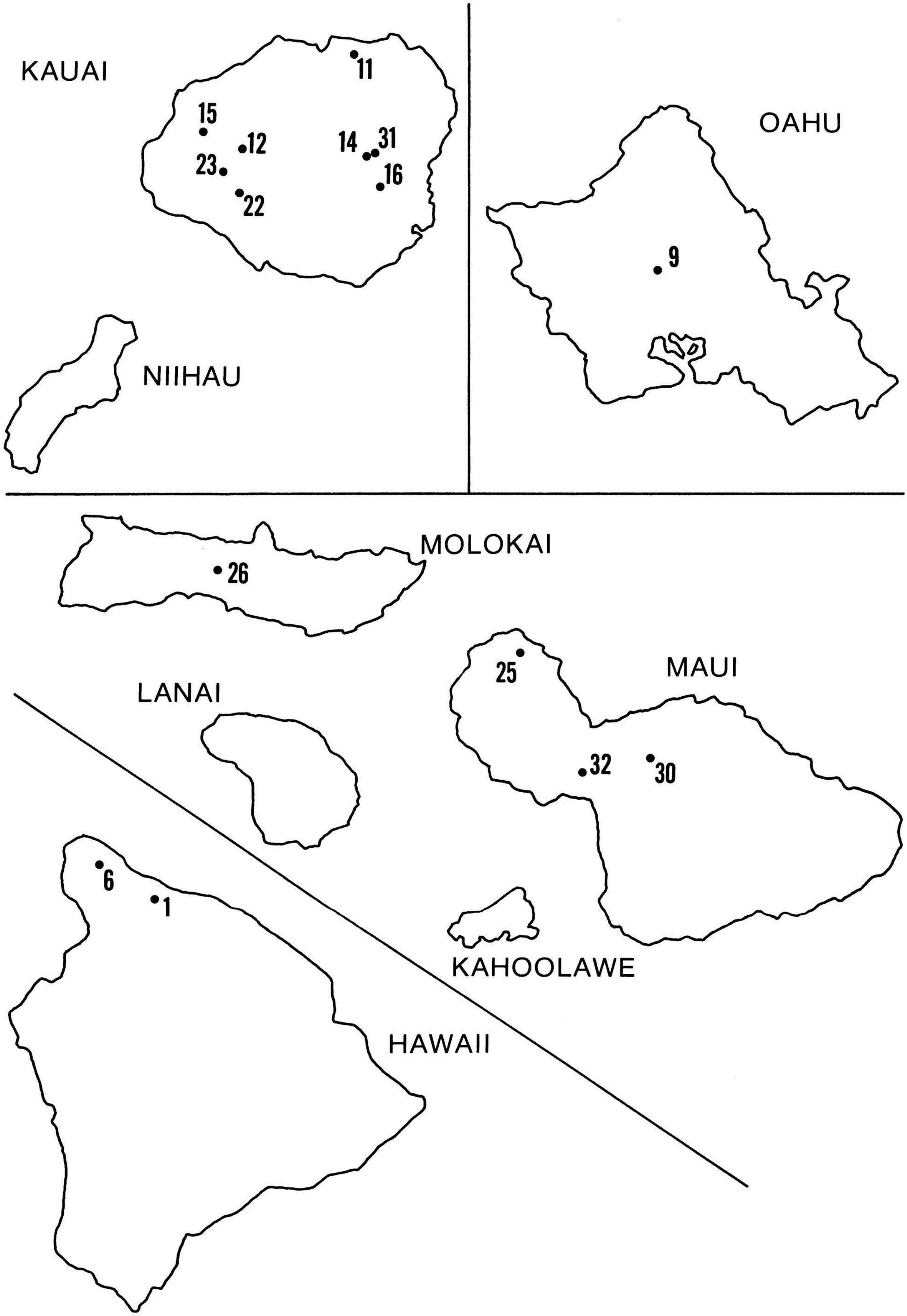

Figure 7-1
LOCATIONS OF POTENTIAL HYDROELECTRIC PROJECTS, HAWAII

Projects in group "e" include Kokee Dam, 234 feet high with maximum storage of 41,000 acre feet, and Waialeale Dam, 185 feet high with maximum storage of 47,000 acre feet. These two projects require significantly more extensive civil-works construction than other projects. Items of work are basically similar to those for group "c" projects, with the addition of reservoir construction. Construction of reservoirs would drastically alter the physical appearance and topography of the site. Regulated reservoir outflows would modify the flow regime of the existing stream.

Economic and Financial Characteristics

Estimated unit energy costs, which are the quotients of total annual project costs over the annual energy, vary from 10 to 255 mills/kWh. Total annual project costs were estimated by summing up the annual maintenance costs and the amortized first costs based on a 50-year project life and the fiscal year 1980 Federal discount rate of 7-1/8 percent. Projects of high unit energy costs include those requiring extensive construction such as large dams or long penstocks, and those with economically unfavorable energy output. However, more than 50 percent of the potential projects have a unit energy cost of 40 mills/kWh or less. This is about the price of surplus energy on the current market.

General Environmental and Social Conditions

All sites with existing hydropower facilities or civil features have no significant environmental concerns. Some of these facilities may no longer be in operation. However, all of the affected waterbodies have had a history of substantial modification to their watersheds. These modifications include clearing of natural riparian vegetation, monoculture commercial crops (and subsequent exposure to biocides), fords and road crossings, total or partial channelization, and urbanization. These waterbodies no longer harbor sustaining populations of endemic or native diadromous fishes, crustaceans or molluscs. There are no significant recreational areas, or sites of local or national historic significance located within or immediately adjacent to any of these waterbodies. Although one or more of these reservoirs and flumes may have been used for potable water supplies in the past, none are apparently being used for that purpose at present.

The Wailua and Waialeale project site on Kauai possesses one of the most disturbed aquatic fauna within the State. Continuous introductions of exotic species and modification of watershed vegetation and the streambed have resulted in the extirpation of virtually all native fauna from this extensive stream system. The lower reaches of the river along the south fork, however, drain the Wailua River State Park. Wailua Falls, the Fern Grotto, and the Wailua River boat ride are favorite tourist destination points which attracted over 4.5 million visitors to the park in 1979. The heavily vegetated banks of the estuarine reaches of the river provide habitat for three endangered Hawaiian waterbirds (Hawaiian coot, Hawaiian gallinule, and Hawaiian duck).

The Waimea river on Kauai, and its major tributary Makaweli Stream, drain the impressive Waimea Canyon. The stream itself has a high complement of indigenous aquatic fauna and is still utilized as a sport fishery. The

Waihee Stream on Maui has been dewatered by past diversions for water supply. However, subsurface discharge and spring flow create marginal habitat for a rare native fish (Lentipes concolor). Further consideration of these streams for hydropower development would require an evaluation of the potential environmental effects of development on these resources.

The Wailoa River is the principal tributary which drains historic Waipio Valley in Hamakua, Hawaii. Waipio was once the site of a large Hawaiian agricultural village; therefore, a substantial number of historic sites and archaeological resources probably exist along the stream. Wailoa/Waipio is the source of numerous ancient legends and has tremendous cultural and spiritual value to Hawaiian people today. The stream itself harbors large populations of migratory and diadromous native fauna. Lower Waipio Valley today harbors one of the State's principal centers of commercial taro agriculture. This wetland crop depends entirely upon maintenance of adequate streamflow for irrigation year-round.

Of the 14 potential projects, Hanalei and Kokee possess the most valuable and significant resources. The lower reaches of the Hanalei River flow through the Hanalei National Wildlife Refuge, which serves as prime habitat for four endangered Hawaiian waterbirds and for migratory waterfowl. Flow from the Hanalei River is needed to irrigate the island's largest commercial taro fields as well as to maintain artificial waterbird ponds. The river itself serves as the center of the seasonal fishery for native goby fishes. The estuary provides a resource for recreational boating, and is a nursery and spawning area for several marine fishes and crustaceans of commercial value. Because the watershed is almost entirely State-owned, excellent hiking trails extend toward the headwaters of the stream and are frequented by hunters, hikers and people collecting fishes and shrimp from the river. The Kokee project occurs within pristine forest reserves and also within portions of the Kokee State Park. This elevated forest is composed predominantly of native vegetation and native, endangered forest birds. Several streams within the area are annually stocked by the Hawaii Division of Fish and Game with rainbow trout to support a very small sport fishery. Much of the watershed area which may be inundated by an impoundment provides habitat for endangered species and is crisscrossed by a network of extremely popular hiking trails.

Sites Deleted Due to Noneconomic Constraints

Seven projects were deleted during Stage 3 because of enviromental, social and institutional constraints. Three of them are on Oahu, and the other four are on Kauai. The following table lists these sites and includes reasons for deletion from further consideration.

Table 7-2
SITES DELETED DURING STAGE THREE

Name of Project	Type of Project	Location	Reason(s) for Being Deleted
Kaneohe-Kailua	Existing Reservoir	Oahu	Incremental capacity is only 0.1 MW. Project purposes (flood control and recreation) not compatible with hydropower development.
Nuuanu	Existing Reservoir	Oahu	Incremental capacity is only 0.06 MW. Dam safety is questionable. Currently under investigation.
Ku-Tree	Existing Reservoir	Oahu	Incremental capacity is only 0.07 MW. Dam has been declared hazardous. Reservoir has been drained.
Lumahai	New Run of River	Kauai	Project site is in significant environmentally pristine area.
Koloko	Existing Reservoir	Kauai	Incremental capacity is only 0.07 MW.
Wainiha	Existing Plant	Kauai	There are no plans to expand the existing capacity of the plant.
Alexander	Existing Plant	Kauai	There are no plans to expand the existing capactiy of the plant.
Waialeale	New Reservoir	Kauai	Alternative to Wailua which would be more economically feasible to develop.

Chapter 8
EVALUATION

8.1 REGIONAL DEVELOPMENT PLAN

A total of 14 projects emerged from the three-stage screening process for possible inclusion in the regional plan. The total incremental capacity of these 14 sites is 37.89 MW, much less than the utility projected additional capacity requirement of 492 MW by 1990. From the preliminary analysis, it appears that some of these projects may not be feasible at the prevailing energy price level. However, the feasibility of these projects may be improved in the future as a result of oil price escalation. To meet the regional objectives of increasing Hawaii's energy self-sufficiency, all these projects were included in the regional plan for potential development.

Economically Optimum System Ranking

Unit energy cost for each selected project was determined manually using published cost curves. These projects were then ranked according to unit energy costs. This ranking is displayed following.

Project ID No.	Project Name	Estimated Energy Cost* mills/kWh	Energy Incremental Potential GWh
22	Hydro Kaumakani	10	8.3
6	Union Mill	24	4.1
9	Wahiawa Res.	29	7.5
11	Hanalei	29	16.5
1	Wailoa	33	12.3
23	Waimea	39	3.9
30	Hamakua Ditch	40	2.5
31	Wailua	46	18.7
15	Puu Lua Res.	63	3.0
32	Hoopoi Chute	64	3.0
26	Kualapuu Res.	72	0.6
25	Waihee	87	2.0
12	Kokee	119	29.2
16	Kapaia Res.	255	0.2

* June 1980 price level.

Environmentally Oriented System Ranking

Two of the 14 selected projects have unique ecological values which may be jeopardized by development of hydropower facilities. An additional four projects possess significant environmental resources within a portion of their watersheds. Future detailed studies on the feasibility of these projects should consider the preservation of certain ecological, recreational, and historical resources. The remainder of the project sites are in disturbed areas, or have little or no significant environmental concerns. The following listing of the 14 projects is in accordance with potential environmental impacts.

No Significant Concerns	Possess Important Resources	Potentially Severe Impact
Union Mill - Hawaii	Wailoa - Hawaii	Hanalei - Kauai
Wahiawa Res - Oahu	Wailua - Kauai	Kokee - Kauai
Puu Lua Res - Kauai	Waimea - Kauai	
Kapaia Res - Kauai	Waihee - Maui	
Hydro Kaumakani - Kauai		
Kualapuu Res - Maui		
Hamakua Ditch - Maui		
Hoopai Chute - Maui		

Developable System Ranking

Projects recommended for further study are listed below on the basis of combined economic and environmental considerations. Projects with high marketability (unit energy cost of up to 40 mills/kWh) and no significant environmental concerns were classified in the high-potential group. Projects with low marketability (unit energy cost in excess of 100 mills/kWh) and/or potentially severe environmental impacts were classified in the low potential groups. The remaining projects were included in the medium potential group.

High Potential	Medium Potential	Low Potential
Hydro Kaumakani	Puu Lua Res	Kapaia Res
Union Mill	Hoopoi Chute	Hanalei
Wahiawa Res	Kualapuu Res	Kokee
Hamakua Ditch	Wailoa	
	Waimea	
	Wailua	
	Waihee	

8.2 SCHEDULE FOR DEVELOPMENT

Short-Term

Short-term projects include Hydro Kaumakani, Union Mill, Wailua, Hamakua Ditch, Hoopoi Chute and Kualapuu Reservoir. They are considered to have a reasonable chance of being developed by 1990 or earlier. Among them, Hydro Kaumakani (Olokele Sugar Company) and Hamakua Ditch and Hoopoi Chute (both owned by Hawaiian Commercial and Sugar Company) are being planned for construction. A reconnaissance study of the feasibility of reactivating the Union Mill hydropower plant was completed by the U.S. Army Corps of Engineers (COE) in October 1979, under the Rural Energy Initiative Program managed by the U.S. Department of Energy. The Hawaii Electric Light Company has subsequently performed further investigations on the site. Implementation has been deferred pending resolution of water and lease agreements with the owner. A hydropower feasibility study of Kualapuu Reservoir was prepared for the State of Hawaii by W. A. Hirai and Associates, Inc. in February 1980. The design and construction of a 90-kW hydroelectric plant was recommended and is being considered by the State. COE is currently undertaking a survey study to determine the feasibility of constructing run-of-river hydropower facilities in the Wailua River Basin. The study is scheduled for completion in fiscal year 1982.

Long-Range

Long-range projects include Wahiawa Reservoir, Hanalei, Wailoa, Waimea, Puu Lua Reservoir, Waihee, Kokee, and Kapaia Reservoir. Although the Kokee project is currently under study, it is unlikely that any of these projects will be developed by 1990.

8.3 FEASIBILITY OF DEVELOPMENT PLAN

The development plan is strictly a preliminary conceptual plan for the Hawaii Region. Detailed site-specific feasibility investigations of these projects have not been performed. However, some indications of the marketability and potential environmental impacts of these projects have been generated from this study and are briefly discussed following.

Short-Term

From the results of preliminary estimates, it appears that the unit energy costs for most of the short-term projects are either below or comparable to the current market value of non-firm surplus energy. The unit energy costs of two projects exceed 40 mills/kWh: Hoopoi Chute (64 mills/kWh) and Kualapuu (72 mills/kWh). Their cost is considerably higher than the current market value but they could be marketable in the very near future. The economic, environmental and composite rankings of these short-term projects are as follows:

Rank	Economic Ranking Project	Rank	Environmental Ranking Project	Rank	Composite Ranking Project
1	Hydro Kaumakani	1	Union Mill	1	Hydro Kaumakani
2	Union Mill	1	Hydro Kaumakani	2	Union Mill
3	Hamakua Ditch	1	Kualapuu Reservoir	3	Hamakua Ditch
4	Wailua	1	Hamakua Ditch	4	Hoopoi Chute
5	Hoopoi Chute	1	Hoopoi Chute	5	Kualapuu Reservoir
6	Kualapuu Reservoir	2	Wailua	6	Wailua

Long-Range

Among the long-range sites, only four of the eight appear to yield a unit energy cost compatible with current market energy values. All the long-term projects are considered for development after 1990. It is possible that energy values will be substantially higher at that time. The marketability of the majority of the long-term projects does not seem to be encouraging at this time but may improve within the decade. The economic, environmental and composite rankings of these long-term projects are as follows:

Rank	Economic Ranking Project	Rank	Environmental Ranking Project	Rank	Composite Ranking Project
1	Wahiawa Reservoir	1	Wahiawa Reservoir	1	Wahiawa Reservoir
2	Hanalei	1	Puu Lua Reservoir	2	Puu Lua Reservoir
3	Wailoa	1	Kapaia Reservoir	3	Wailoa
4	Waimea	2	Wailoa	4	Waimea
5	Puu Lua Reservoir	2	Waimea	5	Waihee
6	Waihee	2	Waihee	6	Kapaia Reservoir
7	Kokee	3	Hanalei	7	Hanalei
8	Kapaia Reservoir	3	Kokee	8	Kokee

Comparison of Hydropower Potential with Demand

As discussed in Chapters 3 and 4, the total capacity of the State's electric system installed by utilities was 1,463 MW in 1978 (excluding MOECO), and the utility projected generating capacity is 1,955 MW in 1990 and 2,533 MW in 1998. Thus, the State needs 492 MW additional capacity by 1990 and 1070 MW by 2000 to meet the capacity requirements for the utilities alone. The additional capacity requirements by 1990 are 278 MW for HECO, 49 MW for HELCO, 145 MW for MECO and 20 MW for KED. By 1998, additional capacity of 588 MW, 90 MW, 340 MW and 52 MW will be needed for HECO, HELCO, MECO and KED, respectively. The total identified hydropower sites without overriding environmental and/or institutional problems, however, only have a total incremental capacity of 37.87 MW. Since potential power generation from all of these sites is needed, they were all included in the development plan.

8.4 SUMMARY

From the standpoint of marketability, most of the projects included in the regional plan have a unit energy cost less than or equal to the current market value of surplus energy. Energy from other projects could be marketable in the near future. From the standpoint of environmental impact, eight projects with existing hydropower facilities or civil features have no significant environmental concerns. Construction of Wailoa, Wailua, Waimea, and Waihee projects may disturb important natural resources. Hanalei and Kokee sites possess very valuable and significant resources and construction activities could cause severe environmental impacts. Key characteristics of the development plan for Hawaii are summarized in Table 8-1. The development of the hydropower sites will not satisfy the additional capacity or energy requirements of the State. The contribution of new and incremental hydropower development is expected to satisfy about 4 percent of the additional capacity demand by 1998. However, the important consideration is that development of any additional hydropower will relieve the State of the equivalent amount of petroleum. Based upon an assumed development of new hydropower plants producing 111.8 GWh of additional energy by the year 2000, the annual savings in oil used to generate electricity would total 186,000 barrels.

Table 8-1
HYDROPOWER DEVELOPMENT PLAN FOR HAWAII

Name of Project	Island	Owner	Rank: Composite	Rank: Economic	Rank: Environmental	Incremental Capacity (MW)	Incremental Energy (GWh)	Type of Project
Short-Term								
Hydro Kaumakani	Kauai	Olokele Sugar Co.	1	1	1	0.75	8.3	Expansion of Existing plant by owner.
Union	Hawaii	Kohala Corp.	2	2	1	0.5	4.1	Rehabilitation of existing plant by owner and Hawaii Electric Light Co.
Hamakua Ditch	Maui	Hawaiian Commercial and Sugar Co.	3	4	1	0.5	2.5	Construction of new run-of-river plant by owner
Hoopoi Chute	Maui	Hawaiian Commercial and Sugar Co.	4	5	1	2.0	3.0	Construction of new run-of-river plant by owner
Kualapuu Reservoir	Molokai	State of Hawaii	5	6	1	0.09	0.6	Construction of new plant on existing reservoir by the State
Wailua*	Kauai	-----	6	3	2	8.4	18.7	Feasibility study of a new run-of-river plant by Corps of Engineers
Long-Range								
Wahiawa Reservoir	Oahu	Waialua Sugar Co.	1	1	1	2.8	7.5	Existing reservoir
Puulua Reservoir	Kauai	Kekaha Sugar Co.	2	5	1	1.7	3.0	Existing reservoir
Wailoa	Hawaii	-----	3	3	2	2.9	12.3	New site (run-of-river)
Waimea	Kauai	Kekaha Sugar Co.	4	4	2	2.9	3.9	Existing plant
Waihee	Maui	-----	5	6	2	0.73	2.0	New site (run-of-river)
Kapaia Reservoir	Kauai	Lihue Plantation Co. Ltd.	6	8	1	0.12	0.2	Existing reservoir
Hanalei	Kauai	-----	7	2	3	4.5	16.5	New site (run-of-river)
Kokee	Kauai	-----	8	7	3	10.0	29.2	New site (storage) New feasibility study pending.

* The selected development in drainage area between Waialeale and Wailua projects.

APPENDIX

SUMMARY LISTING OF POTENTIAL HYDROPOWER PROJECTS

Introduction

A primary objective of the NHS was to inventory and evaluate potential hydropower projects. Projects inventoried included existing dams and other water projects and previously studied undeveloped sites. Project data were compiled from existing information sources supplemented by data from USGS topographic maps, where necessary. No site visits or other field investigations were made. Although to the extent possible, all existing and undeveloped projects were inventoried, only those projects with existing power generating facilities or projects with a reasonable potential for development for hydropower were retained in the NHS inventory. This inventory is permanently maintained in a computer data base which includes descriptive information and the results of a computer analysis of power potential and development costs for each project. In all, the inventory for Hawaii includes 28 projects.

Tabulated Data

The purpose of this appendix is to provide a summary listing of selected data on the 28 existing and potential hydropower projects which were included in the NHS inventory (computer data base) for Hawaii. In the following table, projects are listed in alphabetical order by county. A description of the data included in the table precedes the tabulated information. However, a few items warrant clarification:

(1) Up to four lines of information are presented for each project.

(2) Projects are separated by a space.

(3) As noted in the description of tabulated data. The third character of the project indentification number describes the type and status of the project. A description of each of the possible project status/types is shown in the following matrix:

STATUS OF WATERWAY STRUCTURE	TYPE OF OPERATION: RUN OF RIVER	DIVERSION	RESERVOIR	RES. WITH DIVERSION	IRRIGATION CANAL	STORAGE
EXISTING	A	B	C	D	E	F
EXISTING WITH POWER	G	H	I	J	K	L
EXISTING WITH RETIRED POWER PLANT	M	N	O	P	Q	R
BREACHED	S	T	U	V	W	X
BREACHED WITH RETIRED POWER PLANT	Y	Z	0	1	2	3
UNDEVELOPED	4	5	6	7	8	9

(4) Project costs shown were derived from computer application of generalized cost estimating procedures and should not be construed to be representative of actual costs. Further, it should be noted that as stated in Chapter 5 of this report, final economic screening of potential projects was based on manually computed cost estimates; not on the computer estimates shown in the summary table. The estimated energy costs used in the economic screening and ranking of projects recommended for further study are shown in Chapter 8 of this report (page 8-1).

(5) With a few exceptions, environmental and social impact assessments and codes were completed only for those projects which are recommended for further study (ACTV INV status of "2").

(6) Projects with stars appearing in seventh column (energy) are projects for which insufficient data were available to make a complete computer analysis.

Summary Listing of Existing and Potential Hydropower Projects, Hawaii
Description of Tabulated Data

COLUMN NO.	LINE NO.	FORM 2 ITEM NO.	COLUMN HEADING	DESCRIPTION
1	1	1	SITE ID NUMBER	UNIQUE 10-CHARACTER IDENTIFIER FOR EACH SITE. EXAMPLE: **HICPOH0003** CHARACTERS: VALUE: 1-2 **HI** = **STATE** CODE (POSTAL ABBREVIATION) 3 **C** = **TYPE** AND STATUS CODE (REFER TO FORM 2 ITEM DESCRIPTION DOCUMENTATION FOR ITEM 84). CODES **A** THRU **R** INDICATE **EXISTING** PROJECTS. **S** THRU **3** INDICATE **BREACHED** PROJECTS AND **4** THRU **9** INDICATE **UNDEVELOPED** PROJECTS FOR VARIOUS TYPES OF OPERATION. 4-6 **POH** = U.S. ARMY CORPS OF ENGINEERS **DISTRICT** CODE (REFER TO FORM 2 ITEM DESCRIPTION DOCUMENTATION FOR ITEM 33) 7-10 **0003** = UNIQUE SEQUENTIAL **NUMBER** WITHIN EACH DISTRICT
1	2A	65	DEP CODE	IDENTIFICATION OF UNDEVELOPED PROJECTS AS AN ALTERNATIVE TO SOME OTHER PROJECT OR AS A PART OF SOME SYSTEM. THIS ITEM ALSO INDICATES WHICH ONE OF THE POSSIBLE ALTERNATIVE PROJECTS SHOULD BE INCLUDED IN ESTIMATES OF TOTAL NATIONAL POTENTIAL. THE **DEPENDENT/INDEPENDENT** CODE IS DEFINED AS FOLLOWS: **I** = INDEPENDENT SITE. **E** = DEPENDENT, ALTERNATIVE SITE, EXCLUDED FROM SUMMARIES. **S** = DEPENDENT, PART OF A SYSTEM. THIS SITE SHOULD BE INCLUDED IN SUMMARY TABLES. **D** = DEPENDENT, ALTERNATIVE SITES WHICH ARE CHOSEN BY DISTRICT FOR INCLUSION IN SUMMARY TABLES.

Description of Tabulated Data(continued)

COLUMN NO.	LINE NO.	FORM 2 ITEM NO.	COLUMN HEADING	DESCRIPTION
1	28	3	ACTV INV	**ACTIVE IN INVENTORY** CODE FOR IDENTIFYING SITES BASED ON CAPACITY AND B/C RATIOS. (SEE FORM 2 ITEM DESCRIPTION DOCUMENTATION FOR DETAILED EXPLANATION OF CODES). SOME OF THE MORE COMMON **ACTIVE IN INVENTORY** CODES ARE AS FOLLOWS: 1 = SITES CONSIDERED INACTIVE FOR STUDY THAT HAVE A TOTAL POTENTIAL CAPACITY BETWEEN 50 KW AND 1000 KW AND A B/C RATIO GREATER THAN 1.0. 2 = SITES CONSIDERED ACTIVE FOR STUDY THAT HAVE A TOTAL POTENTIAL CAPACITY GREATER THAN OR EQUAL TO 1000 KW AND B/C RATIO GREATER THAN OR EQUAL TO 1.0 (NOTE: OTHER SITES CHOSEN BY THE DISTRICTS CAN ALSO HAVE A CODE = 2 TO INDICATE **ACTIVE** STATUS). 4 = SITES CONSIDERED INACTIVE FOR STUDY WHERE THE TOTAL POTENTIAL CAPACITY IS LESS THAN 50 KW OR THE B/C RATIO IS LESS THAN 1.0. 5 = SITE CONSIDERED INACTIVE FOR STUDY BECAUSE ADVANCED ANALYSIS SHOWED DEVELOPMENT OF THE SITE TO BE ECONOMICALLY OR ENGINEERINGLY INFEASIBLE. 6 = SITES CONSIDERED INACTIVE FOR STUDY BECAUSE THEY FAILED THE SCREENING ON ADVERSE ENVIRONMENTAL, SOCIAL, AND/OR INSTITUTIONAL IMPACTS.
1	3	53	POWER AREA	ELECTRIC RELIABILITY COUNCIL SUB-REGION (GEOGRAPHIC AREA FOR ALASKA).
2	1	2	PROJECT NAME	IDENTIFICATION **NAME** OF EXISTING DAM OR POTENTIAL WATER MANAGEMENT PROJECT **(NOTE:** ONLY THE FIRST 29 CHARACTERS OF A POSSIBLE 40 CHARACTERS ARE PRINTED).
2	2A	40	PRIMARY COUNTY	PRIMARY **COUNTY** NAME IN WHICH THE PROJECT IS LOCATED.
2	2B	31	NAME OF STREAM	NAME OF **STREAM** WHERE THE PROJECT IS LOCATED.
2	3	60	OWNER	IDENTIFICATION OF PROJECT **OWNER.** NOTE: **DAEN XXX** REPRESENTS U.S. ARMY CORPS OF ENGINEERS WHERE **XXX** INDICATES THE **DISTRICT** CODE (REFER TO FORM 2 ITEM DESCRIPTION DOCUMENTATION FOR A LIST OF DISTRICT CODES AND FEDERAL AGENCIES).
2	4	160	MAP REFERENCE	IDENTIFICATION OF USGS MAP SHOWING LOCATION OF SITES AND OTHER MAPS AS NEEDED FOR IDENTIFICATION.
3	1	36	LATITUDE	IDENTIFICATION OF PROJECT LOCATION BY **LATITUDE** (DEGREES, MINUTES AND TENTHS OF MINUTES).
3	2	37	LONGITUDE	IDENTIFICATION OF PROJECT LOCATION BY **LONGITUDE** (DEGREES, MINUTES AND TENTHS OF MINUTES).
3	3	126	DR. AREA	**DRAINAGE AREA** (IN SQUARE MILES) OF THE PROJECT.

Description of Tabulated Data(continued)

COLUMN NO.	LINE NO.	FORM 2 ITEM NO.	COLUMN HEADING	DESCRIPTION
4	1	62	PROJ. PURP.	IDENTIFICATION OF AUTHORIZED **PROJECT PURPOSES** AS FOLLOWS: **I** = IRRIGATION, **R** = RECREATION **H** = HYDROELECTRIC, **D** = DEBRIS CONTROL **C** = FLOOD CONTROL, **P** = FARM POND **N** = NAVIGATION, **O** = OTHER **S** = WATER SUPPLY
4	2	63	STATUS	INDICATION OF **PROJECT STATUS** AS FOLLOWS: **IS** = IDENTIFIED SITE, **PA** = PROJECT AUTHORIZED **SP** = STUDY PROPOSED, **DM** = GDM IN PROGRESS **SA** = AUTHORIZED FOR STUDY, **UC** = UNDER CONSTRUCTION **FP** = FEASIBILITY STUDY IN PROGRESS, **OP** = PROJECT IN OPERATION **SI** = STUDY INACTIVE
4	3	128	AVE. Q	AVERAGE ANNUAL **INFLOW** (IN CFS). NOTE: **NEGATIVE** VALUES INDICATE **MACHINE DETERMINED** VALUES BASED ON A DRAINAGE AREA RATIO OF THE PROJECT TO THE REPRESENTATIVE GAGE.
5	1	81	DAM HT	PHYSICAL **HEIGHT** (IN FEET) OF DAM ABOVE THE STREAMBED.
5	2	88	TOT. STOR	CUMULATIVE **STORAGE** (IN ACRE-FEET) AT TOP OF FLOOD CONTROL POOL. IF ITEM 88 WAS NOT SUPPLIED, THEN THE STORAGE VALUE WAS TRANSFERRED FROM ITEM 104, **MAXIMUM STORAGE** (IN ACRE-FEET).
5	3	11	PWR. HD.	WEIGHTED NET **POWER HEAD** IF DETERMINED BY PROGRAM: (**ITEM 11**) IF COMPUTED BY FLOW-DURATION PROCEDURE OR TRANSFERRED FROM NORMAL NET POWER HEAD (**ITEM 105**).
6	1	300	EXIST. CAP.	AMOUNT OF **EXISTING CAPACITY** (IN KW) FOR THE PROJECT.
6	2	310	INC. CAP.	AMOUNT OF **INCREMENTAL CAPACITY** (IN KW) THAT IS ESTIMATED FOR THE PROJECT.
6	3	290	TOT. CAP.	AMOUNT OF **TOTAL CAPACITY** (IN KW) THAT IS ESTIMATED FOR THE PROJECT (EXISTING PLUS INCREMENTAL).
7	1	301	EXIST. ENRG.	AMOUNT OF **EXISTING ENERGY** (IN MWH) FOR THE PROJECT.
7	2	311	INC. ENERGY	AMOUNT OF **INCREMENTAL** AVERAGE ANNUAL **ENERGY** (IN MWH) THAT IS ESTIMATED FOR THE PROJECT.
7	3	291	TOT. ENERGY	AMOUNT OF **TOTAL ENERGY** (IN MWH) THAT IS ESTIMATED FOR THE PROJECT (EXISTING PLUS INCREMENTAL).
8	1	318	ANUL. COST	TOTAL **ANNUAL COST** (IN 1000 $) OF PRODUCING THE INCREMENTAL POTENTIAL AVERAGE ANNUAL ENERGY THAT IS ESTIMATED FOR THE PROJECT.
8	2	318/311	ENERGY COST	**COST** (IN $/MWH) OF PRODUCING THE INCREMENTAL POTENTIAL ENERGY THAT IS ESTIMATED FOR THE PROJECT.

Description of Tabulated Data(continued)

EXPLANATION OF ENVIRONMENTAL AND SOCIAL IMPACT CODES: (COLUMNS 7 - 8)

ALPHABETICAL CODES Y, N, AND U ARE DEFINED AS FOLLOWS:

Y = YES
N = NO
U = UNKNOWN

NUMERICAL CODES 1 THROUGH 5 ARE DEFINED AS FOLLOWS:

1 = MAJOR ADVERSE
2 = MINOR ADVERSE
3 = INSIGNIFICANT
4 = MINOR FAVORABLE
5 = MAJOR FAVORABLE

COLUMN NO.	LINE NO.	FORM 2 ITEM NO.	COLUMN HEADING	DESCRIPTION
7	1	668	ENVRNMNTL IMPACT CODE	SEVEN CHARACTER ENVIRONMENTAL IMPACT CODE IS DEFINED AS FOLLOWS:
8	1	669	SOCIAL IMPACT CODE	NINE CHARACTER SOCIAL IMPACT CODE IS DEFINED AS FOLLOWS:

Column 7, seven character environmental impact code:

CHARACTER POSITION	DESCRIPTION
1ST	NATIONAL/STATE PARKS AND WILDERNESS
2ND	WILD AND SCENIC RIVER
3RD	RESIDENT FISH
4TH	ANADROMOUS FISH
5TH	WILDLIFE HABITAT
6TH	ENDANGERED SPECIES
7TH	WETLANDS

Column 8, nine character social impact code:

CHARACTER POSITION	DESCRIPTION
1ST	CULTURAL AND HISTORICAL RESOURCES
2ND	COMMUNITIES RELOCATED
3RD	TRANSPORTATION RELOCATED
4TH	FARMLAND
5TH	LOCAL GROUP COMMENT
6TH	ENVIRONMENTAL GROUP COMMENT
7TH	OTHER GROUP COMMENT
8TH	UTILITY INTEREST
9TH	STATE COMMENT

Summary Listing of Existing and Potential Hydropower Projects, Hawaii
Project Listing

SITE ID DEP CODE / ACTV INV POWER AREA	PROJECT NAME PRIMARY CO. -NAME OF STREAM OWNER MAP REFERENCE	LATITUDE LONGITUDE DR.AREA (D M.M) (D M.M) (SQ.MI)	PROJ.PURP. STATUS AVE. Q (CFS)	DAM HT TOT. STOR PWR. HD. (FT) (AC FT) (FT)	EXIST.CAP. INC. CAP. TOT. CAP. (KW) (KW) (KW)	EXIST.ENRG INC.ENERGY TOT.ENERGY (MWH) (MWH) (MWH)	ANUL. COST ENERGY COST (1000 $) ($/MWH)	ENVIRONMENTAL IMPACT CODE SOCIAL IMPACT CODE
HIHPOH0004	HONOKAA	20 5.8	HI	0	0	0	0	
5	HAWAII LOWER HAMAKUA	155 28.2	UP	0	0	0	0	
	HONOKAA SUGAR CO		0	415.0	0	**********		
HINPOH0005	PAPAIKOU MILL	19 46.9	H	0	0	0	0	NNNNNNN
5	HAWAII HONOLII	155 5.4	OP	0	0	0	0	
	HILO COAST PROCESSING CO		0	207.0	0	**********		UNNNUUUNU
HIHPOH0002	PUUEO	19 43.8	H	0	0	0	0	
5	HAWAII WAILUKU	155 5.5	OP	0	0	0	0	
	HAWAII ELECTRIC LIGHT CO		0	400.0	0	**********		
HIQPOH0006	UNION MILL	20 12.0	HI	0	0	0	94.687	NNNYNNN
I 2	HAWAII KOHALA DITCH	155 48.0		0	500	4100	23. 94	
	KOHALA SUGAR CO	2	41.0	564.4	500	4100		UNNNUUUNU
HIHPOH0003	WAIAU	19 43.4	H	0	0	0	0	
5	HAWAII WAILUKU	155 7.3	OP	0	0	0	0	
	HAWAII ELECTRIC LIGHT CO		0	322.0	0	**********		
HI5POH0001	WAILOA	20 4.8	H	10.0	0	0	11964	NNYYYNY
2	HAWAII WAILOA	155 37.3	IS	0	2900	12300	972.74	
		14	71.0	252.7	2900	12300		YNNYUYUUU
	KUKUIHAELE, KAMUELA QUADS							
HICPOH0009	WAHIAWA RESERVOIR	21 30.0	IR	98.0	0	0	404.89	YNYNNNN
2	HONOLULU KAUKONAHUA ST	158 3.0	OP	0	2800	7500	53.986	
	WAIALUA SUGAR CO	17	-212.0	69.9	2800	7500		NNNYYYUUU
	HALEIWA QUAD							
HIJPOH0018	ALEXANDER RESERVOIR	21 57.6	IHS	119.0	1000	2100	0	
5	KAUAI WAHIAWA STREA	159 31.5	OP	0	0	0	0	
	MCBRYDE SUGAR CO LTD	3	-6.5	699.3	1000	2100		
	KOLOA QUAD							
HI5POH0011	HANALEI	22 7.8	H	10.0	0	0	12020	NNYYYYY
2	KAUAI HANALEI RIVER	159 28.0	IS	0	4500	16500	728.53	
		10	104.0	262.7	4500	16500		YNNYYYUUY
	HANALEI QUAD							

Project Listing(continued)

SITE ID / DEP CODE ACTV INV / POWER AREA	PROJECT NAME / PRIMARY CO. -NAME OF STREAM / OWNER / MAP REFERENCE	LATITUDE (D M.M) / LONGITUDE (D M.M) / DR.AREA (SQ.MI)	PROJ.PURP. / STATUS / AVE. Q (CFS)	DAM HT (FT) / TOT. STOR (AC FT) / PWR. HD. (FT)	EXIST.CAP. (KW) / INC. CAP. (KW) / TOT. CAP. (KW)	EXIST.ENRG (MWH) / INC.ENERGY (MWH) / TOT.ENERGY (MWH)	ANUL. COST (1000 $) / ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE / SOCIAL IMPACT CODE
HIHPOH0022	HYDRO KAUMAKANI	22 0.1	HI	10.0	500	3100	247.61	NNUUNNN
2	KAUAI MAKAWELI	159 36.8	UP	0	750	8300	29.833	
	OLOKELE SUGAR CO	5	-10.1	210.7	1250	11400		UNNNUUUNU
	WAIMEA CANYON QUAD							
HICPOH0016	KAPAIA RESERVOIR	22 1.1	I	0	0	0	0	NNUUNNN
2	KAUAI HANAMAULU STR	159 23.9	OP	0	0	0	0	
	LIHUE PLANTATION CO LTD	2	-9.9	-37.1	0	**********		UNNYUUUUU
HI7POH0012	KOKEE WATER PROJECT	22 7.9	HIRO	240.0	0	0	15508	YNNYYYN
2	KAUAI KAWAIKOI STRE	159 37.0	SI	0	10000	29200	531.12	
	STATE	1	-8.4	959.0	10000	29200		UNNNYYUUY
	HAENA, KEKAHA, MAKAHA POINT,							
HICPOH0017	KOLOKO RESERVOIR	22 10.7	I	0	0	0	55. 33	
5	KAUAI OFFSTREAM	159 22.9	OP	0	68	213	258.32	
	MARY N LUCAS ESTATE	1	-5.5	39.9	68	213		
HIKPOH0021	LOWER LIHUE	22 1.2	HI	0	800	5000	0	
I 5	KAUAI N WAILUA-ILIC	159 26.8	OP	0	0	0	0	
	LIHUE PLANTATION CO		48.0	208.0	800	5000		
HICPOH0015	PUU LUA RESERVOIR	22 5.5	I	110.0	0	0	254.73	YNNNYYN
2	KAUAI TR-HAELEELE S	159 40.8	OP	0	1700	3000	84.911	
	KEKAHA SUGAR CO LTD	7	-63.9	81.9	1700	3000		UNNNUUUUU
	MAKAHA POINT QUAD							
HIKPOH0020	UPPER LIHUE	22 1.4	HI	0	500	3100	0	
5	KAUAI N WAILUA-ILIC	159 27.9	OP	0	0	0	0	
	LIHUE PLANTATION CO		22.0	238.0	500	3100		
HI7POH0014	WAIALEALE	22 1.9	HIR	185.0	0	0	15460	YNYYNYY
E 2	KAUAI SOUTH FORK WA	159 22.8	FP	0	7800	42700	362. 6	
	STATE	18	-57.1	559.4	7800	42700		YNYYYYUUY
	WAIALEALE,KAPAA QUADS							
HIHPOH0024	WAIAWA	21 59.8	HI	0	0	0	0	
5	KAUAI KAHOANA	159 43.5	OP	0	0	0	0	
	KEKAHA SUGAR CO		0	282.0	0	**********		

Project Listing(continued)

SITE ID / DEP CODE ACTV INV / POWER AREA	PROJECT NAME / PRIMARY CO. -NAME OF STREAM / OWNER / MAP REFERENCE	LATITUDE (D M.M) / LONGITUDE (D M.M) / DR.AREA (SQ.MI)	PROJ.PURP. / STATUS / AVE. Q (CFS)	DAM HT (FT) / TOT. STOR (AC FT) / PWR. HD. (FT)	EXIST.CAP. (KW) / INC. CAP. (KW) / TOT. CAP. (KW)	EXIST.ENRG (MWH) / INC.ENERGY (MWH) / TOT.ENERGY (MWH)	ANUL. COST (1000 $) / ENERGY COST ($/MWH)	ENVIRONMENTAL IMPACT CODE / SOCIAL IMPACT CODE
HI7POH0031	WAILUA	22 2.3		10.0	0	0	12878	YNNYYNY
D 2	KAUAI SOUTH FORK WA	159 22.8		0	8400	18700	688.67	
		23	150.0	309.6	8400	18700		YNNYNYUNN
	WAIALEALE, KAPAA							
HIHPOH0023	WAIMEA	22 2.8	HI	10.0	1000	5000	404.78	UNUUUNN
2	KAUAI WAIMEA	159 38.6	OP	0	2900	3300	122.66	
	KEKAHA SUGAR CO	32	-34.5	264.7	3900	8300		YNNNUYUUU
	WAIMEA CANYON QUAD							
HIHPOH0019	WAINIHA	22 11.9	H	20.0	3600	24000	0	
5	KAUAI WAINIHA	159 33.5	OP	0	0	0	0	
	MCBRYDE SUGAR CO	13	-81.0	564.4	3600	24000		
	HAENA QUAD							
HIEPOH0030	HAMAKUA DITCH	20 52.9	I	0	0	0	0	NNUUNNN
I 2	MAUI HAMAKUA DITCH	156 20.1	OP	0	0	0	0	
	HAWAIIAN COM SUG CO		0	0	0	0		UNNNUYUNU
HIEPOH0032	HOOPUI CHUTE	20 53.1		0	0	0	0	NNUUNNN
2	MAUI WAIHEI DITCH	156 30.75		0	0	0	0	
	HAWAIIAN COM SUG CO		0	0	0	0		UNNNUUUNU
HIKPOH0028	KAHEKA	20 53.4	IH	0	5800	25000	0	
5	MAUI WAILOA DITCH	156 21.5	OP	0	0	0	0	
	HAWAIIAN COM SUG CO		0	660.0	5800	25000		
HIHPOH0029	KAUAULA	20 52.6	HI	0	0	0	0	
5	MAUI KAUAULA	156 38.6	OP	0	0	0	0	
	PIONEER MILL CO	2	-1.5	535.0	0	**********		
HICPOH0026	KUALAPUU RESERVOIR	21 9.2	IS	0	0	0	0	NNNNNNN
2	MAUI TR-KALUA PEEL	157 3.0	OP	0	0	0	0	
	STATE OF HAWAII DLNR	2	-7.8	-40.9	0	**********		YNNNUUUNN
HIKPOH0027	PAIA	20 53.3	IH	0	800	2800	0	
5	MAUI WAILOA DITCH	156 20.4	OP	0	0	0	0	
	HAWAIIAN COM SUG CO		0	260.0	800	2800		

Project Listing(continued)

SITE ID DEP ACTV CODE INV POWER AREA	PROJECT NAME PRIMARY CO. -NAME OF STREAM OWNER MAP REFERENCE	LATITUDE LONGITUDE DR.AREA (D M.M) (D M.M) (SQ.MI)	PROJ.PURP. STATUS AVE. Q (CFS)	DAM HT TOT. STOR PWR. HD. (FT) (AC FT) (FT)	EXIST.CAP. INC. CAP. TOT. CAP. (KW) (KW) (KW)	EXIST.ENRG INC.ENERGY TOT.ENERGY (MWH) (MWH) (MWH)	ANUL. COST ENERGY COST (1000 $) ($/MWH)	ENVIRONMENTAL IMPACT CODE SOCIAL IMPACT CODE
HI5POH0025	WAIHEE	20 56.3	H	10.0	0	0	11652	NNYYUUN
I 2	MAUI WAIHEE RIVER	156 32.8		0	730	2000	5826.0	
		3	58.0	240.7	730	2000		YNNYUYUUU
	WAILUKU QUAD							

NHS MAPS

Two maps are inserted into the adjacent pocket. One is an index map and one is a site location map. The primary purpose of the index map is to show the National Electric Reliability Council (NERC) regions, the Corps of Engineers division and district boundaries, and Corps office locations. A separate regional report and accompanying site location map has been prepared for each of the NERC regions depicted on the index map.

The second map shows existing and potential hydroelectric site locations for the subject region and is intended to provide general information to the reader about the sites. The size of a project is depicted by the diameter of the circle and the type of project by color. Each site symbol on the map is labeled with a four digit number which corresponds to a ten character National Hydroelectric Power Resources Study site identification code. Each part of the 10 character ID code helps to narrow down the source of information for that site. For example, a typical site identification code is shown below:

```
            O R   A   N P P   9 9 9 9
      State ──┘   │    │       └── Site ID Number
Type of Project ──┘    └── Corps Division and District
```

Consequently, for more information about a site, one needs to determine from the map a site's state and county, the Corps division and district, and the four digit number. With the site ID number, the site can then be located in the list of sites in the regional report or in Volume XII of the NHS final report. If more detailed information is desired, the appropriate Corps division and/or district office may be contacted.

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NATIONAL HYDROELECTRIC POWER
RESOURCES STUDY

INDEX TO NATIONAL ELECTRIC RELIABILITY COUNCIL REGIONS

INTERIOR—GEOLOGICAL SURVEY, RESTON, VIRGINIA—1981

V. XXIII

NATIONAL HYDROELECTRIC POWER RESOURCES STUDY

ALASKA AND HAWAII


ALASKA AND HAWAII
REGIONS
Electric Reliability Council regions may overlap as a result of transmission line interties
HYDROELECTRIC SITES
Existing dam: power potential fully developed
Existing dam: power potential partially developed
Existing dam: power potential undeveloped
Potential site: further study recommended
GENERATING CAPACITY
25 megawatts and greater
Less than 25 megawatts
CORPS OF ENGINEERS
Division office
District office
Division and district office
Albers Equal Area Projection
SCALE 1:2,000,000
MILES
KILOMETRES
Prepared for the U. S. Army Engineer Institute for Water Resources as a part of
the National Hydroelectric Power Resources Study by the U. S. Geological Survey, 1980
Potential hydroelectric sites north of the Arctic Circle
are not feasible at this time
ARCTIC CIRCLE
K O B U K
U P P E R   Y U K O N
N O M E
Y U K O N – K O Y U K U K
F A I R B A N K S
S O U T H E A S T
N O R T O N   S O U N D
W A D E   H A M P T O N
K U S K O K W I M
M A T A N U S K A – S U S I T N A
V A L D E Z –
C H I T I N A –
W H I T T I E R
C O R D O V A – M C C A R T H Y
Anchorage
ANCHORAGE
B E T H E L
K E N A I – C O O K   I N L E T
SEWARD
B R I S T O L   B A Y
B R I S T O L   B A Y
K O D I A K
A L E U T I A N   I S L A N D S
P A C I F I C   O C E A N
G U L F   O F   A L A S K A
CANADA
S K A G W A Y – Y A K U T A T
HAINES
JUNEAU
A N G O O N
S I T K A
W R A N G E L L – P E T E R S B U R G
P R I N C E   O F   W A L E S
O U T E R   K E T C H I K A N
ALASKA
NORTH PACIFIC DIVISION
ALASKA DISTRICT (NPA)
HAWAII
PACIFIC OCEAN DIVISION (POH)
KAUAI
NIIHAU
OAHU
FT SHAFTER
Honolulu
HONOLULU COUNTY
MOLOKAI
LANAI
MAUI
MAUI COUNTY
KAHOOLAWE
HAWAII
HAWAII COUNTY
P A C I F I C   O C E A N

IWR 82-H-23